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DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEARS 1988 AND 1989

HEARINGS

BEFORE THE

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

ONE HUNDREDTH CONGRESS

FIRST SESSION

ON

S. 1174

AUTHORIZING APPROPRIATIONS FOR FISCAL YEARS 1988 AND 1989 FOR MILITARY ACTIVITIES OF THE DEPARTMENT OF DEFENSE, FOR MILITARY CONSTRUCTION, AND FOR DEFENSE ACTIVITIES OF THE DEPARTMENT OF ENERGY, TO PRESCRIBE PERSONNEL STRENGTHS FOR SUCH FISCAL YEARS FOR THE ARMED FORCES, AND FOR OTHER PURPOSES

PART 5

JOINT HEARINGS

CONVENTIONAL FORCES AND ALLIANCE DEFENSE

AND

DEFENSE INDUSTRY AND TECHNOLOGY

MARCH 17; APRIL 2, 8, 1987

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DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEARS 1988 AND 1989

TUESDAY, MARCH 17, 1987

U.S. SENATE, SUBCOMMITTEE ON CONVENTIONAL FORCES AND ALLIANCE DEFENSE, SUBCOMMITTEE ON DEFENSE INDUSTRY AND TECHNOLOGY, COMMITTEE ON ARMED SERVICES,

Washington, DC.

PRODUCTION RATES OF MAJOR ACQUISITION PROGRAMS

The subcommittees met in open session, pursuant to notice, at 2:08 p.m., in room SR-222, Russell Senate Office Building, Senator Carl Levin (chairman of the Subcommittee on Conventional Forces and Alliance Defense) presiding.

Present: Senators Nunn, Levin, Bingaman, Dixon, Shelby, Thurmond, and Quayle.

Staff present: Carl M. Smith, staff director for the minority; Romie L. Brownlee, deputy minority staff director; Andrew S. Effron, counsel; Richard D. Finn, Jr., John J. Hamre, Daniel J. Wildfong, and Kent Bankus, professional staff members; Kathleen L. McGuire, staff assistant.

Also present: Charles C. Smith, assistant to Senator Dixon; Milton D. Beach, assistant to Senator Glenn; Leon Fuerth, assistant to Senator Gore; Jim Sayer, assistant to Senator Wirth; Terrence Lynch, assistant to Senator Shelby; Henry D. Sokolski, assistant to Senator Quayle; Alan Ptak, assistant to Senator Gramm; Samuel J. Routson, assistant to Senator Symms; and Bill Wight, assistant to Senator Warner.

OPENING STATEMENT OF SENATOR CARL LEVIN, CHAIRMAN

Senator LEVIN. Good afternoon, everybody.

This afternoon the Conventional Forces and Alliance Defense Subcommittee and the Defense Industry and Technology Subcommittee hold a joint hearing to examine in detail the question of the efficiency and the production of major weapon systems.

The Department of Defense is procuring major weapon systems at unbelievably inefficient production rates. More than 9,000 aircraft were produced in a single month of March 1944 during World War II. At today's production rates it would take 10 years to produce that many combat aircraft.

Slow production rates drive up unit costs and delay the modernization of our forces. Increasingly, U.S. soldiers, sailors, airmen and

marines are forced to operate older equipment because we are buying weapons systems at such slow rates.

The Defense Department does not plan to buy weapons inefficiently. Invariably almost every major acquisition program is initiated with plans to buy the system at relatively high production rates. Let us look at the F-18 as an example.

Back in 1980 when the first F-18 was authorized the Navy planned to build up the production rate to buy 186 F-18 aircraft in fiscal year 1986. Indeed, the Navy planned to complete the entire program in just 12 years. The reality has proven to be far different, however. The production rate has never gone above 84 a year. In 1986, the Navy only requested 84 F-18 aircraft, some 45 percent of the original plan. A 12-year program has stretched into an 18-year program, which is a 50 percent increase. According to the SAR reports, the F-18 program is now $2 billion more expensive than the baseline because of stretchouts.

Stretchouts in procurement plans have become commonplace. The average major acquisition program which was originally scheduled to be in production 10 to 12 years is extended to cover 15 to 18 years for the same quantity.

Too much of our defense investment is wasted on inefficient production rates. The Secretary of Defense testified 2 years ago that a third of the payments to prime contractors goes to cover overhead. That percentage, already far too high, will only increase as production rates slow.

While this situation was a tragic extravagance during the period when budgets were growing annually, it is intolerable now that budgets have flattened. We have got to get more output for our defense investment, and improving production efficiency for weapons systems has got to be a key to getting more output.

Today we will hear first from Dr. Robert Costello, who is Assistant Secretary of Defense for Acquisition and Logistics. Dr. Costello has had extensive experience in private industry, including one of the greatest production houses of all time, General Motors Corp. We believe his experience is going to offer us unique insights into this problem.

Then after we hear from Dr. Costello, we will receive testimony from Dr. Robert Hale who is the Deputy Director for National Security and International Affairs at the Congressional Budget Office. Dr. Hale will present the results of a study requested by the Armed Services Committee on this key subject. Indeed, I believe it was requested by Chairman Nunn last year, or the year before.

Before I turn to our witness, though, let me ask Senator Bingaman if he has a statement that he might wish to make at this time.

Senator BINGAMAN. Thank you very much, Senator Levin.

Let me just make a short statement. I do agree that obtaining efficient production rates on our major weapons systems is one area that several of us on the committee are interested in. Senator Nunn, I think, has led the way in pointing up the seriousness of this and the need to address it as part of our investigation of the defense industrial base.

We are obviously not making full use of the industrial capabilities we have in this country, or the technological capabilities. One reason is that we do stretch out programs; not only once they are

in production, but we even stretch out the research phase of the program.

Admiral Inman yesterday in testimony to us was making the point that we need to get things done more quickly in the acquisition process, and that we need to be less concerned about risk. But if we refuse to make some of the hard choices and start too many programs, we inevitably slow everything.

Let me just say that since I have been here on this committee in the last four-and-a-quarter years, as far as I can tell nothing except the DIVAD gun, the Army helicopter improvement program, and the T-46 trainer have actually dropped out of the DOD budget. In the case of the T-46 of course it was a monumental effort last year for that decision to finally be made.

There is a growing awareness here that the waste that results from having too many programs in too small a budget dwarfs all the other examples of spare parts' overcharging and waste that the average citizen hears about. We face some very difficult tradeoffs. Priorities need to be set among the services' requirements for weapons systems.

Again, I welcome Dr. Costello for being here. He was kind enough to testify before the Defense Industry Subcommittee yesterday, and he is very kind to come back again today. I think he will wonder if he actually has an office to go back to one of these days when we finally quit calling him over here to testify.

Thank you very much, Mr. Chairman.

Senator LEVIN. Let me now call on Chairman Nunn for a few words. Again let me remind all of us that one of the subjects of today's testimony is going to be the report of the CBO, which he initiated in his long-standing interest in the problem of program stretchouts which is the backdrop for this hearing today.

Chairman Nunn.

Senator NUNN. I will not take but just a moment. I have got to go to the Intelligence Committee, but I consider this hearing today one of the most important hearings we will have in the deliberative process of marking up the Armed Services bill.

You can argue one weapons system against another. You can argue the overall level of expenditure, but it seems to me we have gotten to the point where it is beyond question that we simply cannot fund efficiently and effectively the number of weapons systems that we now have in the budget. If we continue to go down this line at the same time we are cutting production rates and creating monumental inefficiencies. We are creating new programs that have substantial follow-on funding requirements but very little at the beginning.

Last year we started six new programs, and every one of them can be justified. I am not arguing the merits of them. We spent $2.3 or $2.4 billion, I do not know the exact number, but over the next 10 years those six programs will require $180 billion. So we are getting the foot in the door, and we have no way in the world of continuing them in an efficient, effective way.

So it is a huge problem. Congress is not very good at cutting programs even when the military does not want them, so this is not something easy to deal with over here in the Congress. Once you get a program in production, it always has workers, it has inter-

ests, it has constituencies, it has communities, and it is very, very difficult to stop.

So, I believe the management in this area must start in the Department of Defense, and unless there is good management there, by the time it gets over here it is very hard for us to deal with it. But we are going to have to start dealing with it, and we are going to have to start dealing with it this year.

We may not make it. We may not be able to complete what we start, but somebody has got to start it, and I have not seen it coming from the Department of Defense or this administration.

So, Dr. Costello, we are anxious to hear your views on this. I do not think it is a matter of ideology. I do not think it is a matter of whether you are for or against a certain level of defense expenditure. It is simply a matter of management and arithmetic, and you cannot fund efficiently and effectively the number of programs we now have with the budget levels which are inevitable under this budget pressure we are now under.

So, Mr. Chairman, I thank both you and Senator Bingaman for having these hearings. I will be in and out. I will be back here as soon as I can from the Intelligence Committee, but I will be following it very closely. I think again this is one of the most important hearings we will have.

Senator LEVIN. Thank you, Senator Nunn.

Senator Quayle.

Senator QUAYLE. Thank you, Mr. Chairman.

I would like to welcome my friend, Dr. Costello. I am sure that you have all the answers to the questions that have been raised. You have been on the job now for a few short weeks.

I think that there are two issues to follow up on which Senator Nunn has been discussing. The one issue that we have got to be very concerned about, and that the Congress can do something about, is funding stability. I mean, having some stability and predictability on what the funds are going to be, because we just go from one year to the next and that causes all sorts of problems. You can refer to it as his previous employment where you had some certain degree of stability, and I think that that is the one thing we ought to be very concerned about.

We have tried, and we have talked about a 2-year budget which is helpful, but it is very difficult to get it through. We do not even know what the budget is going to be this year. We are still arguing. We will be back and forth on what it is going to be, and however that budget comes out, as it begins to ratchet down, we will have to change to certain production lines and certain rates of output. So I think funding stability, however we can work to achieve that, is going to be very, very helpful.

The other thing that I hope we can do, and I hope Dr. Costello can work with us on, is what we have tried over the years, and that is to develop a consensus on how we can in fact proceed—a consensus with Congress, with the Pentagon, and with the contractors.

I will be honest with you—and I think the chairman would probably agree with me—we have been somewhat chagrined over the years that there is this little bit of apparent mistrust between everybody. We do not trust the DOD. DOD is always wondering, or

complaining about all the micro management. Yet when we ask them to come forward and say what they want to repeal, there are very little things that they really want to repeal. There is a lot of mistrust out there in the contracting industry.

They do not really know who is going to do what to them, and you have really got a rather contemptuous situation out there. I think that is most unfortunate. And it is a difficult task. You have got a political environment you have got to deal with. You have got a declining balance of resources that you have got to deal with. You have got all sorts of things that you have to deal with.

But developing some sort of consensus and allowing good management and flexibility with the proper oversight and direction from the Congress is something I hope that we can achieve. It is going to be very, very difficult because you have got a lot of unique participants involved, but I think funding stability and developing that consensus will be the two things that hopefully we can achieve.

Thank you.

Senator LEVIN. Thank you, Senator Quayle.

Senator Shelby.

Senator SHELBY. Thank you, Mr. Chairman.

Dr. Costello, I welcome you again to the committee. This is my first appearance before you here, but we had some hearings on your nomination earlier.

I share some of the views of my colleagues here today, but I think the bottom line when you start talking about canceling weapons systems—and there are some that ought to be cancelled or cut back—would be what effect would these programs have? How would they affect national security?

I think that is the bottom line. I know there are politics everywhere, including certainly in the Senate. But when you approach this I think that you should approach it from that standpoint and give us the unvarnished, blunt truth of what we need to know. Perhaps then we will act on it. I am not saying we will, but there are very few weapons systems that have been curtailed or cancelled in the last few years, and since I have been in the Congress—this is my ninth year—I do not know of many that have died on their own initiative.

With shrinking dollars, we are going to have to make some high priorities here. I think the bottom line is national security. Where do we go? Are we going to be able to cover the gaps that have been talked about here? In your new position, you are going to be right in the middle of it. I hope that you are going to be able to lead us in some other directions.

I look forward to your testimony.

Senator LEVIN. Dr. Costello, welcome.

We would hope you would summarize your statement, if you would. The entire statement will be made a part of the record.

I will also insert for the record the prepared statement of Senator Dixon.

[The prepared statement of Senator Dixon follows:]

PREPARED STATEMENT OF SENATOR ALAN J. DIXON

Mr. Chairman, today's hearing will focus on production rates for major weapons system. Dr. Robert Costello, Assistant Secretary of Defense for Acquisition and Logistics, and Mr. Robert Hale, Deputy Director for National Security Division, Congressional Budget Office will be our witnesses.

The purpose of this hearing is to examine why the Department of Defense allows the services to purchase weapon systems inefficiently. It seems that Congress is presented with a DOD Budget that shows the services buying weapon systems at relatively high rates. However, those rates invariably get cut back as the system matures because there are insufficient funds to procure the system at the original quantity.

Stretchouts have become a common feature of the Defense Budget submitted to Congress. Each year for the past 3 years DOD has stretched out the procurement plans of approximately a third of all major weapon systems. This year is worse? Nearly 60% of the munitions lines (air to air missiles, torpedos, air to surface missiles, and others) are stretched out compared to last year's budget request.

Mr. Chairman, it is clearly our responsibility and the other subcommittees, to restructure the administration's priorities as we face budgetary constraints over the next few years.

STATEMENT OF ROBERT B. COSTELLO, ASSISTANT SECRETARY OF DEFENSE FOR ACQUISITION AND LOGISTICS

Dr. COSTELLO. Chairman Levin, Chairman Bingaman, and Chairman Nunn, it is a pleasure to be here. You have all played significant roles in my being here. I appreciate that and I want to recognize the personal contribution you have made.

Senator LEVIN. Usually the "chairmen" are in the minority at any meeting. At this particular meeting, the chairmen are in the majority. [Laughter.]

It is three to two.

Dr. COSTELLO. I am impressed. But it actually reflects the significant importance of this very crucial issue of efficient production rates; and their impact on our national industrial base. Now I have a green carnation on, at least two of us do, and we need some luck on a day like this. I am going to take the luck of the Irish and we will see how it goes for the rest of the day.

When I was first involved in materiels management, I was in Indiana at the time, and I was responsible, I felt, for all of the problems. Everybody else was looking to blame somebody. We had a coat of arms, "It's His Fault." I look at it today, and we are in kind of the same place. "It is his fault". But I told them: "I will take responsibility for it, but while you are pointing with one finger at me and say it is my fault, help me with the other hand so we can accomplish something together."

I think Senator Quayle aptly said, "We need to do it together." There are several parts of the equation, and industry must play a different role. We will get to that, perhaps.

To summarize my opening statement, I asked the staff to bring me up to date: where things have been and where we are today. I think it is important. It says that we are in difficulty today, and we all recognize it. I can say, well, I was not here when it happened; but I am here now and I am responsible for what happens now, and where we go.

It has been a significant, continuing policy of the Defense Department to maintain efficient production rates; and they did that planning job, as Senator Levin pointed out. But fluctuations have been significant; and I use the term "we", as both sides of this

table have been part of that equation. We need to deal with it in a very effective way from here on out. Because, if we do not deal with it, we will be dealt with.

So, we have perhaps been a little optimistic in where we are going. The air of optimism has perhaps passed. I had an experience with General Motors that dealt with the same problem. How do we deal with the flexible demands that we have?

In the automobile industry, you start a plant running at the beginning of the year and it is not shut down. You run out of orders, and you still try to figure out how to keep it going, similar to what we are doing.

I took part in a major review of the approach in production rates; with my participation, we instituted at the end of this effort a thing called a "trigger mechanism." If we did not have the orders, we finally shut down the plant. If we did not have more than three weeks of orders, we automatically shut down the plant.

Now that is a brutal way to go about the same kind of problem, but I think the analogy is appropriate to the situation in which we find ourselves. What we have done over a period of time is substantially improve on a quantitative, absolute number. There are many good examples of the kinds of things that we have done.

We have not met the rates; we have not met the final goal; and we have been forced, because of the constraints that we have lived with, to do some stretching. It turns out, if priorities are maintained on certain issues such as strategic modernization, vigorous support of the technological base, the people programs, readiness programs, and quality of life, the flexibility ends up being in procurement concepts, and programs, and they too are involved in readiness activities and the quality of life programs.

What has happened in all of those? We have had stretchouts, and they have been costly. The industrial base considerations also have to be paramount in our discussions. If we do not do something, we could have a program or a concept in which we have no M1 tank production, or no major battle tank production in our industrial base. Before we take the approach to not stretch out the M1 but to cut it off on some higher level, we have to look at the entire industrial base. These efforts are not independent.

I think that we also have to involve industry to a much higher level than we have before, because that level of overhead, the level of engineering, and the level of other support activities may have to be carefully scrutinized to see what they can do also to participate in some lower level of actual production. We will take it upon ourselves to review that and direct some attention from industry to that effort.

In short, there is a problem. I am concerned about how significant and how large that problem is. It does need more attention. It needs more DOD attention. It needs your attention, and you are giving it with the presence of the people here today; but it also involves industry to achieve, as Senator Quayle pointed out, that consensus. But I think some of us may not have been pulling in the same direction as the people here in this room. Although I think DOD and the Senate have worked very closely together.

Now as Assistant Secretary of Defense for Acquisition and Logistics, I hope to be able to inject that concept of efficient production

and affordability considerations into all of the processes as an active member of the various senior decisionmaking boards in the Defense Department. That is my role, and I take it on with seriousness.

I will try to focus more attention on this issue, both within the Defense Department and within industry. Frankly, we hope to do better in the future and urge your continued support and involvement, which I think we are going to have, as demonstrated today in this committee hearing.

I will be glad to answer any questions that you would like to put forth at this time.

[The prepared statement of Dr. Costello follows:]

PREPARED STATEMENT OF DR. ROBERT B. COSTELLO
Assistant Secretary of Defense
for Acquisition and Logistics

GOOD AFTERNOON MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE. I AM PLEASED TO BE HERE THIS AFTERNOON IN MY FIRST APPEARANCE BEFORE THESE TWO RECENTLY CREATED COMMITTEES. MY COMMENTS TODAY FOCUS ON THE CONTINUING DoD COMMITMENT TO ACHIEVING THE MOST EFFICIENT AND EFFECTIVE DEFENSE POSSIBLE.

THE ACHIEVEMENT OF EFFICIENT PRODUCTION RATES FOR OUR MAJOR WEAPON SYSTEMS HAS BEEN AND CONTINUES TO BE A PRIORITY INITIATIVE FOR THE DEFENSE DEPARTMENT. BECAUSE OF THE OBVIOUS ECONOMIC BENEFITS OF EFFICIENT PRODUCTION RATES AND THE SENSITIVITY OF COST TO RATE CHANGES IN MANY PROGRAMS, THE DEPARTMENT HAS MADE A VERY CONSCIOUS EFFORT TO ENSURE THAT PROCUREMENT PROGRAMS ARE STABILIZED AT THE MOST EFFICIENT RATE FEASIBLE, TAKING INTO ACCOUNT FISCAL AND OPERATIONAL CONSIDERATIONS.

EVERY YEAR, FOR EXAMPLE, DURING THE INTERNAL PROGRAM AND BUDGET REVIEW THAT PRECEDES OUR FINAL BUDGET SUBMISSION TO THE CONGRESS, PRODUCTION RATES FOR PROCUREMENT PROGRAMS PROPOSED BY THE SERVICES ARE EVALUATED AND RECOMMENDATIONS MADE TO THE SENIOR LEADERSHIP OF THE DEPARTMENT REGARDING WHICH PROGRAMS WOULD BENEFIT MOST FROM MORE EFFICIENT RATES. THROUGH THIS PROCESS, THE DEPARTMENT ATTEMPTS TO REALLOCATE RESOURCES AS NECESSARY AMONG SERVICE PROGRAMS IN ORDER TO ENHANCE STABILITY. OF COURSE, THIS EFFORT IS SEVERELY CONSTRAINED BY AVAILABLE FISCAL RESOURCES -- RESOURCES THAT ARE BECOMING MORE AND MORE LIMITED.

WE RECOGNIZE THIS LIMITATION ON BUDGET RESOURCES AS AN ECONOMIC FACT. THE DEFENSE BUDGET TOPLINE REPRESENTS THE AMOUNT

OF NATIONAL RESOURCES THAT THE COUNTRY IS WILLING AND ABLE TO DEVOTE TO NATIONAL DEFENSE IN ANY GIVEN YEAR. HOWEVER THE CONTINUED REDUCTIONS IN OUR BUDGET TOPLINE ARE PERHAPS THE PRIMARY OBSTACLE TO PROGRAM STABILITY AND EFFICIENT PRODUCTION RATES. THEY HAVE PROFOUND IMPLICATIONS FOR NOT ONLY INDIVIDUAL PROGRAM PRODUCTION RATES BUT ALSO THE STABILITY OF THE DEFENSE PROGRAM AS A WHOLE.

IT IS A PROBLEM THAT THE DEPARTMENT CANNOT SOLVE BY ITSELF. THE DEPARTMENT LOOKS TO CONGRESS AS A PARTNER IN THE EFFORT TO INCREASE PROGRAM STABILITY. WE HAVE HAD DIFFICULTY OVER THE PAST SEVERAL YEARS OBTAINING FROM CONGRESS THE RESOURCES WE HAVE DEEMED NECESSARY IN OUR FORMAL BUDGET REQUESTS. FROM FY 1982 THROUGH FY 1987, FOR EXAMPLE, DEFENSE OUTLAYS WERE REDUCED BY $62B FROM OUR REQUESTED AMOUNTS.

CONSISTENTLY, WE HAVE HAD DIFFICULTY IN PLANNING OUR OUT YEAR PROGRAMS BECAUSE OF THESE FLUCTUATIONS. TWO YEARS AGO, FOR EXAMPLE, THE DEPARTMENT PROJECTED A TOPLINE OF $395B FOR FY 1988, IN CONSTANT FY 1988 DOLLARS. LAST YEAR WE PROJECTED $340B FOR FY 1988. THE CURRENT PRESIDENT'S BUDGET REQUESTS A TOTAL OF $304B FOR FY 1988, A REDUCTION OF SOME $90B FROM OUR PLAN OF TWO YEARS AGO, AND $36B IN THE PAST YEAR ALONE. INDEED, CONGRESSIONAL PROJECTIONS HAVE SUFFERED A SIMILAR FATE. THE BUDGET RESOLUTION PASSED BY THE CONGRESS DURING THE SUMMER OF 1985, LESS THAN TWO YEARS AGO, CALLED FOR AN FY 1988 DEFENSE TOPLINE OF $347B. DUE PRIMARILY TO CONGRESSIONAL CUTBACKS ON THE ORDER OF $60B FROM REQUESTED LEVELS DURING THE PAST TWO YEARS, THE DEPARTMENT HAS SUBMITTED ITS FY 1988 REQUEST AT THE $304B PREVIOUSLY MENTIONED. THE IMPLICATIONS OF THIS INSTABILITY ON OUR PLANNING PROCESS ARE OBVIOUS.

OUR FLEXIBILITY IN RESPONDING TO THESE FLUCTUATIONS IS VERY LIMITED. WE HAVE ATTEMPTED TO ADHERE TO THE PRIORITIES THIS

ADMINISTRATION ENUNCIATED SOME SIX YEARS AGO WHEN IT BEGAN ITS DEFENSE BUILDUP. IN THE FACE OF MUCH LOWER BUDGET LEVELS THAN WE HAD PLANNED FOR, THIS HAS BECOME INCREASINGLY DIFFICULT.

THE PRESIDENT'S STRATEGIC MODERNIZATION PROGRAM, ANNOUNCED IN OCTOBER 1981, REMAINS ONE OF OUR HIGHEST PRIORITY EFFORTS. WE ARE WELL ALONG IN A FAR-REACHING REVITALIZATION OF OUR STRATEGIC OFFENSIVE AND DEFENSIVE FORCES AND THEIR SUPPORTING COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE SYSTEMS. THIS STRATEGIC MODERNIZATION PROGRAM, IN COMBINATION WITH THE STRATEGIC DEFENSE INITIATIVE, WILL ENHANCE OUR ABILITY TO DETER AGGRESSION, STRENGTHEN STABILITY AND PROVIDE THE SOVIETS WITH INCENTIVES FOR SUITABLE ARMS REDUCTION. AS YOU KNOW, THIS PROGRAM INCLUDES A WIDE ARRAY OF SPECIFIC ACQUISITION PROGRAMS -- THE B-1 AND ADVANCED TECHNOLOGY BOMBER, THE M-X PEACEKEEPER, THE MIDGETMAN SMALL ICBM, THE TRIDENT II MISSILE, STRATEGIC DEFENSE INITIATIVE, AND THE ANTI-SATELLITE MISSILE SYSTEM (ASAT), FOR EXAMPLE. BECAUSE OF THE CONTINUED PRIORITY WE ACCORD THESE EFFORTS, THEY HAVE BEEN KEPT RELATIVELY IMMUNE FROM THE LARGE FLUCTUATIONS IN DEFENSE FUNDING.

THE RESULTS OF THIS POLICY HAVE BORNE FRUIT. AS YOU ALL KNOW, WE ARE NOW IN THE MIDST OF SIGNIFICANT ARMS REDUCTIONS NEGOTIATIONS WITH THE SOVIETS. OUR DEDICATION TO THE PRESIDENT'S STRATEGIC PROGRAM OVER THE PAST SIX YEARS HAS MADE THIS POSSIBLE.

STRATEGIC MODERNIZATION HAS NOT BEEN THE ONLY AREA ACCORDED HIGH PRIORITY BY THE ADMINISTRATION. PEOPLE AND QUALITY OF LIFE PROGRAMS CONTINUE TO RECEIVE A GREAT DEAL OF EMPHASIS. AS A RESULT THE MILITARY PERSONNEL APPROPRIATION HAS ENJOYED FAIRLY STEADY GROWTH. THE READINESS AND SUSTAINABILITY OF OUR COMBAT FORCES ALSO CONTINUE AS MAJOR DEFENSE PRIORITIES. BUILDING ON

THE SIGNIFICANT IMPROVEMENTS WE HAVE MADE IN THESE AREAS IN THE PAST, WE CONTINUE TO ALLOCATE SUBSTANTIAL RESOURCES TO THE VARIOUS ACCOUNTS THAT CONTRIBUTE TO OUR MAINTAINING THE COMBAT FORCES AT THE LEVELS OF READINESS AND SUSTAINABILITY WE ALL DEEM NECESSARY TO SUCCESSFULLY DETER AGGRESSION WORLD-WIDE. ALONG THAT LINE, FOR EXAMPLE, WE ARE KEEPING THE OPERATIONAL TRAINING ACTIVITIES AT THE HIGH LEVELS WE HAVE BUILT TO OVER THE PAST SEVERAL YEARS. FLYING HOURS FOR OUR COMBAT AIRCREWS, BATTALION TRAINING DAYS IN THE FIELD, AND STEAMING HOURS FOR OUR SHIPS ARE BUT A FEW MEASURES OF OUR PROGRESS. BUT MAINTAINING OUR HIGH PRIORITY IN THESE AREAS CONTINUES TO REQUIRE SUBSTANTIAL RESOURCES -- IN THE MILITARY PERSONNEL ACCOUNTS; IN O&M FOR FUEL AND DEPOT MAINTENANCE; AND IN VARIOUS OTHER ACCOUNTS FOR PEACETIME OPERATING STOCKS AND REPLENISHMENT SPARES.

THE NATURE OF OUR PROBLEM SHOULD BE EVIDENT. CONTINUED FUNDING OF THESE HIGH PRIORITY INITIATIVES -- STRATEGIC MODERNIZATION, PEOPLE AND QUALITY OF LIFE, READINESS AND SUSTAINABILITY AT THE LEVELS BOTH THE CONGRESS AND THE ADMINISTRATION DEEM NECESSARY, IN AN ERA OF DECLINING RESOURCES -- DECLINING AT LEAST WITH RESPECT TO PLANNED LEVELS -- LEAVES US WITH LITTLE, IF ANY, FLEXIBILITY IN OUR PLANNING AND PROGRAMMING PROCESS.

INVARIABLY, THE PROCUREMENT ACCOUNT BECOMES THE PRIME SOURCE FOR REDUCED FUNDING IN THIS SCENARIO. THE RESEARCH AND DEVELOPMENT (R&D) APPROPRIATIONS TEND TO SUFFER LESS, IN A RELATIVE SENSE, BECAUSE OF THE NEED TO MAINTAIN A VIGOROUS NATIONAL RESEARCH EFFORT AND ENHANCE OUR TECHNOLOGICAL ADVANTAGE. THE MILITARY PERSONNEL AND OPERATIONS AND MAINTENANCE (O&M) APPROPRIATIONS DEMONSTRATE SIMILAR UPWARD TRENDS, PRIMARILY BECAUSE READINESS CONTINUES ITS HIGH PRIORITY AND OUR WORLD-WIDE COMMITMENTS FORCE US TO FUND THE MILITARY

FORCES AT THE LEVELS WE PRESENTLY PLAN. BECAUSE ADMINISTRATION AND CONGRESSIONAL PRIORITIES TEND TO SHIELD A LARGE PORTION OF THE BUDGET (E.G., O&M AND MILPERS COLLECTIVELY REPRESENT OVER 50% OF THE BUDGET), MAJOR PRODUCTION PROGRAMS INEVITABLY BEAR THE BRUNT OF BUDGET REDUCTIONS.

ALL OF THIS IS BORNE OUT BY EMPIRICAL DATA. FOR THE PERIOD FY 1984 THROUGH FY 1987, THE R&D APPROPRIATION INCREASED (TOA IN CONSTANT FY 1988 $) FROM $30.6B TO $38.3B (26% INCREASE). THE O&M APPROPRIATION INCREASED FROM $78.8B TO $84.6B DURING THE SAME TIME PERIOD (7% INCREASE). THE PROCUREMENT APPROPRIATION, HOWEVER, DECREASED FROM $97B TO $89B (8% DECREASE). MORE INDICATIVE OF THE PROBLEM WE HAVE FACED IN ADJUSTING TO THE DRASTIC REDUCTIONS IN OUR TOPLINE PROJECTIONS IS THE ALLOCATION OF THESE REDUCTIONS TO SPECIFIC ACCOUNTS. RECALL OUR PROJECTION TWO YEARS AGO OF AN FY 1988 TOPLINE OF $395B IN CONSTANT FY 1988 DOLLARS AND A TOPLINE OF $340B PROJECTED A YEAR AGO COMPARED TO THE $304B REQUEST WE SUBMITTED TWO MONTHS AGO. IN ADJUSTING TO THESE CONSTRAINTS WE REDUCED THE O&M REQUEST IN FY 1988 FROM THE PROJECTION OF $108B TWO YEARS AGO AND $94B A YEAR AGO TO $87B -- 18% AND 13% DECREASES RESPECTIVELY. AT THE SAME TIME PROCUREMENT FUNDING HAS BEEN REDUCED FROM $141B TO $102B TO THE $84B WE ARE REQUESTING THIS YEAR. WE HAVE LOST ROUGHLY 40% OF OUR PLANNED FY 1988 PROCUREMENT FUNDING IN TWO YEARS; ROUGHLY 18% IN THE PAST YEAR, A STAGGERING AMOUNT BY ANY MEASURE.

THE UNFORTUNATE RESULT OF THESE REDUCTIONS IS THAT PROCUREMENT PROGRAM STRETCHOUTS BECOME UNAVOIDABLE. SOME PROGRAMS HAVE BEEN TERMINATED OUTRIGHT AND OTHER PROGRAMS STOPPED SHORT OF THE PREVIOUSLY PLANNED PROCUREMENT OBJECTIVES. THE DIVAD GUN, THE ARMY HELICOPTER IMPROVEMENT PROGRAM (AHIP), AND THE T-46 TRAINER ARE THREE RECENT EXAMPLES OF MAJOR PROGRAM CANCELLATIONS. YET THESE VERY EXAMPLES DEMONSTRATE THAT PROGRAM

TERMINATIONS DO NOT ELIMINATE THE MISSION REQUIREMENT THAT ORIGINALLY SPAWNED THE PROGRAM. WHEN DIVAD WAS TERMINATED IN 1985, THE ARMY'S AIR DEFENSE NEEDS DID NOT EVAPORATE SUDDENLY. RATHER, THE ARMY IS CURRENTLY DEVELOPING ITS FORWARD AREA AIR DEFENSE SYSTEM (FAADS) TO MEET THIS REQUIREMENT. FURTHERMORE, CONGRESS HAS SHOWN ITSELF TO BE A RELUCTANT PARTNER, TO SAY THE LEAST, IN OUR ATTEMPTS TO ELIMINATE LOW PRIORITY OR INEFFECTIVE PROGRAMS. LAST YEAR'S TREATMENT OF OUR PROPOSED T-46 TERMINATION IS AN EXAMPLE OF THE PROBLEMS ENCOUNTERED IN SUCH ACTIONS. PROGRAM TERMINATIONS THEREFORE, WHILE EFFECTIVE IN A STRICTLY ECONOMIC SENSE, ARE INCOMPLETE SOLUTIONS TO THE PROBLEMS OF PROVIDING AN EFFICIENT AND EFFECTIVE NATIONAL DEFENSE. PROGRAM STRETCHOUTS, ON THE OTHER HAND, WHILE INEFFECTIVE IN THE STRICTLY ECONOMIC SENSE, OFTEN REPRESENT ONE OF THE ONLY VIABLE SOLUTIONS TO MEETING DEFENSE NEEDS.

INDUSTRIAL BASE CONSIDERATIONS ARE ALSO A CONSTRAINING ELEMENT IN RESOURCE DELIBERATIONS. THE ABILITY OF THE INDUSTRIAL BASE TO SUPPORT FLEXIBLE RESPONSES TO NATIONAL EMERGENCIES IS CRITICAL TO OUR NATIONAL SECURITY POSTURE. ACCORDINGLY, THE DEPARTMENT, AND INDEED THE NATION, HAVE A VESTED INTEREST IN MAINTAINING THE HEALTH AND VIABILITY OF THE INDUSTRIAL BASE. SOMETIMES, THIS CAN ADVERSELY AFFECT PRODUCTION RATES. ALTHOUGH FUNDED AT EFFICIENT RATES OF PRODUCTION DURING RECENT YEARS, THE M-1 TANK PROGRAM IS NOW PLANNED FOR PRODUCTION AT LOWER RATES INSTEAD OF PREVIOUS PLANS TO BUY OUT THE PLANNED INVENTORY. THIS IS DUE IN LARGE PART TO INDUSTRIAL BASE CONSIDERATIONS. SIMPLY STATED, THE COUNTRY CAN ILL AFFORD TO HAVE NO BATTLE TANK PRODUCTION LINE IN OPERATION. TO DO SO WOULD SEVERELY DAMAGE OUR SURGE AND MOBILIZATION POSTURE.

OTHER CONSIDERATIONS LEAD US TO LOWER PRODUCTIONS THAN

PLANNED. OCCASIONALLY, SYSTEMS RUN INTO UNEXPECTED TECHNICAL DIFFICULTIES. IN SUCH CASES -- AMRAAM IS A RECENT EXAMPLE -- WE PRUDENTLY DEFER OR SLOW DOWN OUR PROCUREMENT UNTIL THE NATURE OF THE PROBLEM IS IDENTIFIED AND A FIX DESIGNED. SOMETIMES, WE ARE PRODUCING A SYSTEM AT THE SAME TIME THAT WE ARE DEVELOPING AND TESTING AN IMPROVEMENT OR AN UPGRADE -- OFTENTIMES A PRE-PLANNED PRODUCT IMPROVEMENT. IN THESE CASES WE MIGHT DECIDE TO SLOW DOWN PRODUCTION OF THE OLDER MODEL IN ANTICIPATION OF THE UPGRADE BEING READY FOR PRODUCTION. PRODUCING AND INTRODUCING A SYSTEM INTO OUR COMBAT FORCES AT HIGH RATES THAT MIGHT ALREADY BORDER ON TECHNICAL OBSOLESCENCE -- OR BE SUSCEPTIBLE TO COUNTERMEASURE BY ENEMY FORCES -- WHEN THE IMPROVED VERSION IS NEARING PRODUCTION, DOES NOT MAKE SENSE EITHER. RECENT EXAMPLES ARE THE STINGER MISSILE, THE PHOENIX MISSILE AND THE A-6E AIRCRAFT.

YET ANOTHER CONSIDERATION IS CONGRESSIONAL INTENT OR WILL. WE SHOULD NOT CONTINUE TO PLAN AND PROGRAM PROCUREMENTS AT PRODUCTION RATES CLEARLY OUT OF LINE WITH CONGRESSIONAL ACTION ON PREVIOUS REQUESTS. FOR EXAMPLE, CONGRESS HAS MADE ITS VIEWS QUITE CLEAR ON SUCH PROGRAMS AS THE AIR FORCE'S F-15E STRIKE EAGLE, F-16 FALCON, MAVERICK MISSILE, THE NAVY'S F/A-18 HORNET, AND THE ARMY'S BRADLEY FIGHTING VEHICLE BY REDUCING PROCUREMENT FROM OUR REQUESTED LEVELS.

DESPITE THESE FORMIDABLE OBSTACLES, THE DEPARTMENT HAS MOVED FORWARD, IMPLEMENTING SEVERAL INITIATIVES DESIGNED TO FOSTER PROGRAM STABILITY AND EXPLOIT ECONOMIES OF SCALE. OUR MULTIYEAR PROCUREMENT (MYP) EFFORT HAS BEEN QUITE SUCCESSFUL, DUE IN LARGE PART TO THE COOPERATION OF THE CONGRESS. DURING THE FY 1982-FY 1987 PERIOD, THE DEPARTMENT HAS REQUESTED MYP FOR 67 PROGRAMS, 45 OF WHICH HAVE ACTUALLY BEEN APPROVED. THE ESTIMATED SAVINGS ACHIEVED THROUGH THIS PROGRAM EXCEED $7B. MYP HAS BEEN

REQUESTED FOR NINE PROGRAMS IN OUR FY 1988/1989 BUDGET SUBMISSION. IF APPROVED, THESE PROGRAMS ARE EXPECTED TO SAVE APPROXIMATELY $1B.

DoD-WIDE BASELINING IS ANOTHER RECENT INITIATIVE THAT WILL CONTRIBUTE TO PROGRAM STABILITY AND CONTROL COST GROWTH. UNDER THIS CONCEPT, THE DEFENSE ACQUISITION EXECUTIVE (DAE), SERVICE ACQUISITION EXECUTIVE (SAE), AND THE PROGRAM MANAGER (PM) WILL AGREE TO A SET OF FORMALLY ESTABLISHED GOALS AND OBJECTIVES FOR A PROGRAM. THIS FORMAL, DEPARTMENT-WIDE AGREEMENT WILL REFLECT THE COMMITMENT OF THE DoD TO THE PROGRAM AND THE WILLINGNESS TO AFFORD THE PM THE REQUISITE AUTHORITY TO MANAGE HIS PROGRAM WITHIN THE SCOPE OF THE BASELINE. WE ARE CURRENTLY IN THE PROCESS OF DESIGNATING MAJOR WEAPON SYSTEMS TO BE BASELINED IN THIS FASHION.

THE DEFENSE ENTERPRISE PROGRAM IS AN EVEN MORE RECENT INITIATIVE THAT THE DEPARTMENT HAS ENTHUSIASTICALLY ENDORSED. FOR FY 1988, WE ARE PLANNING TO DESIGNATE 10 ACQUISITION PROGRAMS AS ENTERPRISE PROGRAMS. ENTERPRISE PROGRAMS WILL BE SUBJECT TO A STREAMLINED MANAGEMENT STRUCTURE CONSISTING OF THE PM, THE PROGRAM EXECUTIVE OFFICER (PEO), THE SAE, AND THE DAE. OUR LONG RANGE GOAL IS FOR ALL ACQUISITION PROGRAMS TO OPERATE IN A SIMILIAR FASHION. MILESTONE AUTHORIZATION WILL BE REQUESTED FOR THREE ENTERPRISE PROGRAMS. PROGRAMS APPROVED FOR MILESTONE AUTHORIZATION WILL HOPEFULLY ENJOY THE COMMITMENT OF THE CONGRESS FOR THE DURATION OF A PARTICULAR ACQUISITION MILESTONE PHASE.

WE ARE ALSO WORKING ON A VARIETY OF INITIATIVES DESIGNED TO ENHANCE PLANNING AND CONTROL COSTS. ONE OF THESE IS THE COST OF QUALITY INITIATIVE. THIS INITIATIVE IS AIMED AT SIGNIFICANTLY IMPROVING QUALITY OF SYSTEMS AND PROCESSES IN TERMS OF FITNESS

FOR USE AND EFFICIENCY. OTHER INITIATIVES INCLUDE IMPROVING THE QUALITY OF THE ACQUISITION WORKFORCE, ENHANCING THE INDUSTRIAL BASE, CODIFICATION OF FEDERAL PROCUREMENT LAWS, AND IMPROVING DoD/INDUSTRY RELATIONS.

IN SUMMARY, WE HAVE EXPERIENCED SOME STRETCHOUTS IN PRODUCTION RATES PRIMARILY BECAUSE OUR PLANNED SPENDING LEVELS WERE SIGNIFICANTLY REDUCED. OTHER PROGRAMS WERE STRETCHED BECAUSE OF TECHNICAL DIFFICULTIES, INDUSTRIAL BASE CONSIDERATIONS AND, COMPLIANCE WITH CONGRESSIONAL PROGRAM REDUCTIONS. FRANKLY, WE HOPE TO DO BETTER IN THE FUTURE. FORTUNATELY, WE HAVE MAINTAINED IMPORTANT MOMENTUM IN MULTIYEAR CONTRACTING, COMPETITION, AND HOPE TO INCREASE PROGRAM STABILITY AND EFFICIENCY THROUGH BASELINING AND OTHER REFORMS SUGGESTED BY THE PACKARD COMMISSION, THE CONGRESS, AND THE SECRETARY OF DEFENSE AND TO BE CARRIED OUT BY THE NEW ORGANIZATION OF THE UNDER SECRETARY OF DEFENSE FOR ACQUISITION. I LOOK FORWARD TO WORKING WITH ALL OF YOU AND URGE THE CONTINUED SUPPORT OF THE CONGRESS.

THANK YOU AND I WOULD BE PLEASE TO ADDRESS ANY QUESTIONS THAT YOU MIGHT HAVE.

Senator LEVIN. Thank you very much, Dr. Costello.

NEW STARTS

Would DOD be willing to prioritize the list of new starts to tell us which of the new starts in this budget that is being proposed has the highest priority, the next highest priority, and so forth, to help us if we decide to delay a new start, or to kill a new start all together to give us the wisdom of the DOD in that process?

Dr. COSTELLO. From what I know and from my participation to date, they believe they have done that. As we put further constraints on, by putting the budgets together and going through the Joint Requirements Management Board and the Defense Requirements Board, it will force a review of that process.

Senator LEVIN. Well you have not prioritized clearly in the budget. There is no way that you could do that in the budget docu-

ment that I know of, but we can do it through hearings and through informal mechanisms to let us know what their thinking is on this issue.

Otherwise, we are acting without it, which is something of a disadvantage. It is not impossible. We did it basically last year, but I see no reason—following Senator Quayle's logic here about cooperation and greater trust between Congress and the DOD and industry—I see no reason why you should not find a mechanism to let us know what those priorities are in your view, even if you cannot do it formally through a hearing process.

Dr. COSTELLO. I think that sense of cooperation has to encompass that type of interaction between the two.

Senator LEVIN. Would you look for a mechanism to let us know what the priorities are on the new starts? Would you seek a mechanism?

Dr. COSTELLO. I will search for the mechanism and discuss it with Under Secretary Godwin.

Senator LEVIN. What new starts were killed in this budget request that is in front of the Congress?

Dr. COSTELLO. I am not in a position to answer that question.

Senator LEVIN. Would you let us know for the record, Dr. Costello?

Dr. COSTELLO. We will let you know for the record.

[The information follows:]

NEW STARTS

Dr. COSTELLO. First, I think I should clarify the different definitions that the committee and the department assign to the term "new starts". When we speak of new starts in the department we are referring to actual new programs, programs at Milestone 0 if you will. The committee's definition is broader and encompasses not only our definition but also includes programs that have moved into either full scale development or full rate production. One place that new starts (our definition) are killed is in the competition for scarce resources in the Service POMs (Program Objective Memoranda) during the Program Review process. I do not have a specific list, but I am confident that there were some. I do not believe the OSD (Office of the Secretary of Defense) review process cancelled any major system new starts in the preparation of the FY 88 budget.

PROGRAM STRETCHOUTS

Senator LEVIN. Of the 20 largest weapons systems in the budget, half of them this year are stretched out compared to last year's plans, and 25 percent of them are being proposed for manufacture this year below the minimum sustaining production rates for those systems.

Now I am wondering how the DOD can propose that, given the Carlucci initiatives which said the elimination and prevention of stretchouts is one of the initiatives? Is it no longer one of the DOD's initiatives? Is that part of the Carlucci program no longer?

Dr. COSTELLO. The direction is to have the most effective production schedule possible. If you compare what was planned in 1987 as to what was submitted in the 1988 budget, you will find roughly a 25 percent reduction in the procurement account. That gets reflected in further stretchouts.

Senator LEVIN. But it could also get reflected in delays of new systems, or elimination of new systems. There are a number of

ways to reflect the budget constraints that you are in, and I am wondering why it is that you picked the most inefficient one, which is the stretchout, over the delay of a new start which is inefficient, but not as inefficient, as the killing of a system all together.

Dr. COSTELLO. There are a series of other issues that get involved. Some programs are delayed because of technical problems. Some programs are stretched out because maybe the operating forces don't have a structure to absorb the production that would be there at a higher rate. It is still a major issue, but it is not the only one to be discussed in setting those schedules.

Senator LEVIN. Who in the DOD argues against stretchout as the solution to the fiscal constraint? Who is the advocate for other alternatives? Who is the person who says, "for gosh sakes, let's not pursue the most inefficient answer, which is the stretchout," the easiest one in lots of ways politically, but who is the advocate there against stretchouts?

Dr. COSTELLO. I am the advocate.

Senator LEVIN. Did your office this year advocate against, or advise strongly against the stretchouts that we see in this budget request?

Dr. COSTELLO. The position of the advocate is to go in with data and demonstrate the impact of a decision based solely on an economic perspective or a manufacturing perspective. If these were the only reasons, then we would perhaps recommend some other level or rate of production. This is now part of the new process—that you have been structuring with the Under Secretary for Acquisition—that will go up to the Defense Acquisitions Board, where we will take into account those considerations.

I will be the proponent of saying, look, these are the impacts. This is what we could achieve, and that is one of the inputs.

Senator LEVIN. Well, pursuing that for a moment, during your nomination hearing I asked you whether or not your office had been involved in the budget decisions this year that led to a number of stretchouts in the budget, and asked whether your office specifically had fought against those strechouts, and you indicated that you were not around at the time so you would have to let us know about that and report back to us.

Now I do not know that we have gotten that report. I do not think we have yet. But are you in a position today to tell us specifically—give us some examples—what role your office played before your coming and opposing the stretchouts that we see in this budget. Which ones did you advise against that are still in this budget?

Dr. COSTELLO. I did not advocate a position as a consultant, or as a part of a staff activity. I think you have to go in and say, this is our position and these are the economic impacts. The decisionmaking was, at the time, at the Joint Requirements Management Board, and it will be similar at the Defense Acquisitions Board.

Senator LEVIN. So that you view your role as crunching numbers basically, and not giving a recommendation on efficiencies?

Dr. COSTELLO. I was a member of the board. I am not sure whether we are going to be voting or not, but I will have to give my recommendation based on the data that I have, yes.

Senator LEVIN. Well, did your predecessor on the board, whoever was playing that role before you were here, make that argument to the board against stretchouts that still appeared in this budget?

Dr. COSTELLO. I am not in a position to answer, but we will give you an answer for the record.

Senator LEVIN. Okay.

[The information follows:]

ASD(A&L)'S MANAGEMENT ROLE

One of the most important roles of the Assistant Secretary of Defense for Acquisition & Logistics (ASD(A&L)) has always been as the proponent for production efficiency. My understanding is that my predecessor was always vocal in his support for efficiency and affordability in defense acquisition. During last year's budget deliberations, we were particularly hard-pressed to come up with program reductions in light of Gramm-Rudman limits and general fiscal constraints. In this environment, it was very difficult to increase funds to be allocated toward more efficient production rates; it was simply a more difficult problem than in past years.

F-18

Senator LEVIN. Now going back to the F-18 which is the example I mentioned before. In 1980 when the F-18 program was first started, the Navy said that it was going to be buying 186 F-18s in fiscal year 1986 and 186 in fiscal year 1987. By the way, in 1981 they actually increased that plan to 191.

In 1982 they increased the plan to 209. In subsequent plans, they begin whittling away, and last year we procured 84 F-18s. So that in the 1986 fiscal year budget we actually procured 84 F-18s, and we were supposed to by then be buying 186 F-18s. It was on that basis and at that efficiency level that we decided to begin to procure the F-18s.

Now I would like to ask you about your experience in private industry at this point, and take General Motors. What would be the impact on the cost of planning to produce 186,000 cars per year in one plant, buying the tools and the facilities to do that, and then actually producing only 84,000 cars in that plant, about 45 percent of the original goal. Based on your experience, what would be the impact on unit costs and so forth.

Dr. COSTELLO. There is almost a direct corollary for those numbers decreasing from 186,000 to 84,000. Unfortunately, in the new Detroit assembly plant, in which there was a significant downturn in the demand for those cars, there was a reduction in the production rate. That has a major impact on the bottom line.

Senator LEVIN. On the unit cost?

Dr. COSTELLO. Both, on the unit cost, or profitability.

Senator LEVIN. My 10 minutes are up.

Senator Bingaman.

Senator BINGAMAN. Thank you very much, Mr. Chairman.

Let me ask Mr. Costello, I am having Kent hand you a graph which I think we have given you a copy of before. It is a graph that our staff, Dr. John Hamre put together. I think it points up the seriousness of the problem as we see it.

BOW WAVE

This shows the funds required for new starts, for six of the new starts that we agreed to in 1987 in the current year. So this has

already been done. As you can see, the cost gets way up here. I think these were the figures that Senator Nunn was referring to where he said the cost was a couple of billion dollars to start these last year, a little over two billion, and it is going to cost us $180 billion before we are through building them down the road.

I just wonder. Are charts similar to this recognizing the total life cost of these programs? Are these used in your planning process at the Department of Defense in the preparation of your budget?

Dr. COSTELLO. Yes, they are; and I think it demonstrates beautifully the concern we have for a bow wave. You can start something, but then you just have that large increase of expense in down years.

One of the first questions I asked, when I came to Washington was "What is the perspective? Doesn't anybody worry about those downstream costs?" My concerns are well described in this chart.

Senator BINGAMAN. I guess my question is, when that bow wave really peaks out here in about 1992 with these particular six new starts, is there a plan as to where that funding comes from in the budgets of DOD? Or is there an expectation that the Congress would increase funding enough that you would not have to cut anything else?

Senator LEVIN. You do have some compensating program terminations. I am not sure which ones balance which at this time—but if you look at the C–17 you would also say, well, we will have fewer C–5s or C–5Bs. So you can go down through some of those and say there will be compensations made. You can look at others and you have to say, where is the money going to come from? I have been asking some of those questions.

Senator BINGAMAN. My understanding is that the budget we now have before us from the administration has 15 systems for which we are being asked to approve initial procurement funds in 1988 and 1989. Then there are 13 additional programs we are being asked to provide initial research funds in 1988 and 1989.

Is there somewhere in the Department of Defense a plan for where the funding is going to come from to actually fund these 15 systems when this bow wave hits for them? We do not have a chart for the 15 that we are being asked to approve this year.

Dr. COSTELLO. I think this whole discussion forces us to focus our attention on what I call a "milestone zero review." I do not think that the economics or the manufacturing base have been looked at rigorously in the milestone zero review, because that is usually a technical review. If it looks like a good technical program and is technically justified, then a new start is authorized.

I expect to vigorously participate in those milestone zero reviews.

Senator BINGAMAN. You were indicating in answer to Senator Levin that you see one of your responsibilities is to advocate against stretchouts as an inefficient solution. What would you see as the role or responsibility of this program analysis and evaluation?

Now I have understood that they have some responsibility to concern themselves with the problem we are talking about today. Is that accurate?

Dr. COSTELLO. That is accurate, and I think we have to work very closely with Dr. Chu's staff in that regard. We have some resources

we borrowed from them. We have transferred people, so that we have excellent communications and they have excellent capability to help us in that regard.

Senator BINGAMAN. Let me just underline Senator Levin's request there. Unless something happens with our schedule, we are supposed to start marking up the authorization bill on the 21st of April at the subcommittee level. If we could have some recommendations as to these 15 new starts that are in the 1988 and 1989 budget request, that would be a very useful thing to know about.

PRODUCTION AT INEFFICIENT RATES

Let me just ask sort of a follow-on question to this whole line of inquiry. If in fact we are producing at very inefficient rates now, which I guess everybody is agreeing that we are, should we conclude that there is a tremendous amount of excess capacity in the defense industry today, and that fixing this problem of inefficient production rates would lead to a substantial shakeout of defense contractors, and a substantial reduction in the number of operations or number of contractors, prime contractors and others producing for the Department of Defense?

Dr. COSTELLO. I think you stated the problem very well. There is a capacity problem. In this case, not a lack of, but a greater capacity than we may need; but you have to define what that need is. You may say, well, we need some surge capability and that has to be looked at very, very carefully. That says we have to do some different definitions than what we have done before.

It gets back to some of the discussions we had at the hearings yesterday; that the industrial base has a different perspective today, because we are not the only ones that have excess capacity. The world has built excess capacity in the weapons business as well. I think that is reflected in our decrease in foreign military sales. I think there is a direct reflection.

Again, if we can broaden our base then we can make better utilization of that industrial base.

TRADEOFF

Senator BINGAMAN. There is a point that Mr. Hale makes in his testimony here that I thought was very interesting, and one that I would like you to comment on. He points out that maintaining higher production rates for current weapons, which we are all trying to find ways to do now, will obviously delay the benefits from new technology for several years to come. So there is something of a tradeoff here I guess.

We are saying that to the extent we do not go forward on new starts, to the extent we increase production rates in some of the programs that are already there and going, we do delay the implementation of new technology into our weapons system.

Do you have any thoughts on that tradeoff?

Dr. COSTELLO. Senator Levin indicated earlier that these long stretchouts also preclude our introducing new technology. I think that as Dr. Hale had indicated in his brief here, that at the front end you may do that, but maybe at the back end it allows you to

introduce it more readily. So there is a balance we have to play, and I do not think we have found that formula yet.

Senator BINGAMAN. That is all I have, Mr. Chairman. Thank you very much.

Senator LEVIN. Senator Shelby.

Senator SHELBY. Thank you, Mr. Chairman.

Dr. Costello, are you familiar with Dr. Hale's findings that he has recommended here?

Dr. COSTELLO. I have read them, yes, sir.

RECOMMENDED CANCELLATIONS

Senator SHELBY. As I recall, he recommended that we cancel further procurement of the F–15, cancel the C–17 program, cancel the anti-satellite missile, cancel the Trident refit program, slow the Trident SSBN construction, defer new program starts until 1990, reduce purchases of the MX missile, and cancel the V–22 aircraft development program.

What are your thoughts on these recommendations, and how would these recommendations, if carried through, affect our national security?

Dr. COSTELLO. I think that he has done an excellent job of reviewing what financial returns or financial analysis would do, but then you have to say that, if I do not buy more F–15s, have I met the mission that the Joint Chiefs of Staff have established for us and for those F–15s that we were going to buy. So his analysis is correct, and I think his recommendations should be looked at as a rigorous scrubbing of the economics of the program.

Senator SHELBY. Are you talking about numbers of the program basically?

Dr. COSTELLO. Numbers on the program basis.

Senator SHELBY. Do you know if his analysis has gone into the national security aspects of the program as well as the numbers of the budget aspect?

Dr. COSTELLO. I am not sure that all of the people involved with the national security aspects would be comfortable with his number crunching.

Senator SHELBY. Do you know anyone over at the Congressional Budget Office, other than Dr. Hale, who worked on this?

Dr. COSTELLO. No, I do not.

Senator SHELBY. And you do not know their qualifications or capability, do you?

Dr. COSTELLO. No, sir.

Senator SHELBY. Or their insight into national security programs, do you?

Dr. COSTELLO. No, sir.

Senator SHELBY. Would some of these people over there have the highest clearance as to what is going on in national security?

Dr. COSTELLO. Oh, I am sure they would, and I am sure from their perspective, like in all of the committees, with the support structure that you have, you have experts that look at these matters. But then from my brief review, they are not in concert with some of the people in the Pentagon that I have also talked to about those issues.

OFFSHORE SOURCING

Senator SHELBY. Dr. Costello, when we were hearing some testimony on your nomination earlier in the full committee, I asked you some questions about the policy of offshore sourcing, and we got into that insofar as national defense was concerned.

Have you, since you have been confirmed only a short time, had an opportunity to give any further thought on this program of offshore sourcing as far as maintaining over a long haul our national security in the event of war?

Dr. COSTELLO. I have continued to look at that particular aspect. There is some relatively small amount of R&D funding that we do spend offshore where we have identified unique capabilities. At present, we still have a positive trade balance in the systems that we are selling offshore.

I think that that subject is going to be even more difficult for us as some of the other countries look to market their production capability, which is what they are doing when they sell us product. I spent some time this morning on a program that we are going to have with industry later this week, and they are looking at the offshore sale of the systems that we have.

I think that we have to be very sensitive to that issue, because we need to have in any way, in any program that we have, the capability there to meet our needs. We cannot sole-source offshore without any chance of bringing that technology here.

Senator SHELBY. Dr. Costello, if you do some indepth studies on that, I am sure the committee, the chairman and all of us, would be interested in you sharing that with us at a future date.

Dr. COSTELLO. I will look forward to that.

Senator SHELBY. That is all I have, Mr. Chairman.

Senator LEVIN. Thank you, Senator Shelby.

Senator Dixon.

Senator DIXON. Thank you, Mr. Chairman.

Dr. Costello, it is a pleasure to have you before us again. I apoligize for the fact that I was elsewhere engaged and did not get to hear all of your testimony.

APACHE ATTACK HELICOPTER

The Army has made a recommendation to discontinue I think in 1988 the Apache attack helicopter, as you know, and has indicated that they will wait for the development of the next helicopter line, the LHX, which it is suggested will be not too many years in the future.

Are you aware of all of that?

Dr. COSTELLO. Yes, I am, sir.

Senator DIXON. First of all, have you looked into the question of how long it really will be before the next helicopter is on line?

Dr. COSTELLO. If the schedule is met, it looks like we will have a void in significant helicopter production procurement for our use, in 2 to 3 years.

Senator DIXON. I would say, Dr. Costello, that there are some in the Army that might argue that, but the evidence that most of us have at hand woud seem to indicate it could be as long as ten years before that helicopter is really a serviceable helicopter. They are

still arguing about whether it ought to be a bird using one person or two people, and a variety of other things. They have not even determined the kind of armament and things of that character.

I am wondering whether your office could review all of this subject thoroughly for us?

Dr. COSTELLO. You might be interested to know that I have had a meeting with the contractor regarding that program, and the Apache program that would be terminated. He has come in with a multi-year procurement. I have asked him to go back and look at his program to say, what could you do with a stripped down program?

I had mentioned yesterday that we are looking for some test cases in which we can work, beforehand, with the Inspector General, the Defense Contract Audit Agency, and the Comptroller, to carefully structure a test program in which we have minimized all of the oversight, the controls, and the costs. I have been told we could reduce costs maybe as much as 20 or 30 percent of the total cost of the program.

I have asked him to look at his program, strip down his organization, and come in with a proposal to perhaps make the present unit even more attractive than it is today, and to look at the total build-out of that program over a different matrix of cost and time. I am waiting for them to come back and talk with us.

Senator DIXON. I might say to you, Dr. Costello, I have flown that bird. I strikes me as a very excellent attack helicopter. I would suggest that possibly it deserves further evaluation in view of the fact that I think we need a tank killer. I do not think there is any question about that. The evidence seems abundantly clear that we are a long time away for the LHC serving that purpose, if it ever is designed incidentally for precisely that function. It is clearly at this point in time not nearly as heavily armed or as able to do the job, I think, as the Apache.

For instance, you cite in your testimony here something that impresses me when you talk about the DIVAD gun and the fact that we are still looking. I had a lot to do with the discontinuance of the DIVAD gun. It seems to me that discontinuing a line that did not work is a lot different than discontinuing a functioning piece of machinery that does the job it is intended to do.

If my information is correct, it is the best there is.

Dr. COSTELLO. There is scheduled—we have changed the name from Joint Requirements Management Board to Defense Acquisition Board—a milestone review, in May or early June, and these issues will be brought to their attention.

Senator DIXON. I greatly appreciate the independent evaluation by an agency such as yours. I think some of us are suspicious that maybe the Army which admittedly is short this year, as all the services are but that one in particular, may have figured we might continue the line anyway. I think that would have been a temptation of theirs. Or in the alternative, I think there is substantial belief that there is sufficient support in the Congress that we would proceed in any event.

I would like to have your independent evaluation at your convenience.

[The information follows:]

LHX/AH-64 Issue

Later this month (April 87), the Defense Acquisition Board (DAB) will be reviewing the LHX program in depth. The OSD (Office of the Secretary of Defense) staff is in the process of preparing analyses for the consideration of the DAB principals. These analyses will describe and evaluate a wide array of alternatives and this will include an evaluation of the AH-64. The intent of the DAB process is to raise issues such as this for consideration by top level management.

SPARE PARTS

Senator Dixon. My subcommittee has been holding hearings right along contemporaneously with my distinguished colleague from Michigan, the chairman of this subcommittee. We have been doing all of the preparatory work for the markup on the question of supplies, spare parts, ammunition, depot maintenance, real estate maintenance, and things like that. The CINCs and others have expressed concerns about the fact that the chart has been going up since 1981 to a peak right about now, and how all those charts will be going down over the next several years.

Some folks suggested some interesting things this morning that I would like to have the benefit of your expertise on. They said it is not really that we are buying less spare parts in the next few outyears, but that we are getting more for the dollar and just doing a better job of buying spare parts.

Is there any substantial evidence to support that point of view, so far as you know from your agency's investigations of this subject matter? Are we in fact up and down the line in most particulars really starting to buy a whole myriad number of spare parts at a cheaper rate than we were for a long time?

Dr. Costello. From the information that I have, I am sure the Air Force is one of the key players in this role. With the competition programs that have been put in place, there have been significant cost reductions. I think that one of the major opportunities we have is to look at what can we do in our total structure for cost reduction and to continue that type of favorable impact on readiness in the defense budget.

Senator Dixon. The testimony this morning came from an admiral on behalf of the Navy. It would be interesting to me to have, in view of my sponsorship in the past of the Competition in Contracting Act, and the Breakout prcgrams, and other things, whatever evaluation on an independent basis would be available in your agency. If you could get that to this committee at some time showing some kind of a comparative analysis, I would be very interested in seeing whether we are making that kind of an impact, or is the cooperation of the various agencies with the Congress and others making that kind of an impact on our purchases.

Dr. Costello. Some of that data has been made available, but I think it should be put in a different context at this time. I have the advantage of having the former Navy deputy competition advocate on my staff, so I think we can get you some of the specifics that you are looking for.

[The information follows:]

Lower Prices for Spare Parts

Over the past 3 years, the Department has achieved significant improvements in the cost and quality of spare parts. Fiscal year 1986 spare parts initiatives produced

documented net savings of $1.6 billion. These savings are in addition to the $1.2 billion and $1.3 billion recorded respectively for fiscal years 1984 and 1985. Recent savings represent not only a maturing of the initiatives started approximately three years ago, but also reflect continuing strong management attention to procurement reform in general and spares acquisition and management in particular. Most of the original spares initiatives and procurement reform laws have been implemented and are now a permanent part of the way the Department conducts its business.

The primary focus of the spares initiatives has continued to be on increasing competition. The Department achieved a 57.2 percent overall competition rate based on procurement dollars and an 81.9 percent rate based on procurement actions for fiscal year 1986. These rates are up from fiscal year 1983 rates of 39.8 percent and 55.2 percent respectively.

Last year, the breakout program saved $421 million. Through this initiative parts previously procured from a prime contractor are screened to determine if they can be procured from either an actual manufacturer or through competition. In fiscal year 1986, approximately 310,000 items were screened, 62,000 were coded for procurement from the actual manufacturer, and another 61,000 for procurement through competition.

The Department has also continued to work at removing impediments to competition and promoting increased participation in the DOD vendor base. Technical data issues continued to receive major emphasis, including the updating of our technical data repositories with state-of-the-art optical disk technology. Our buying activities continue to sponsor events such as competition fairs and visits to potential vendors, and competition catalogs to encourage more companies to compete for DOD business.

Value engineering initiatives which review not only the cost but the quality of spare parts have saved nearly $297 million in fiscal year 1986.

Modern technology offers unparalleled opportunities for improved productivity. The Defense Logistics Agency's Paperless Ordering Placement System, is an adaptation of electronic ordering systems currently used in the private sector.

Although the above-mentioned actions have allowed the Department to acquire spares at lower unit prices over the past few years, much work remains to be done. We are embarking on an orderly process to consolidate our gains and map out appropriate directions for the future. The Department is developing a Phase II spares management improvement program which will be structured around improving the front-end phase of the weapon system acquisition process, refining procurement procedures, enhancing workforce effectiveness, and measuring and reporting the results of our efforts. In addition, we are pursuing a separate but related project to reduce procurement and production leadtimes to improve efficiency and reduce the costs of managing the inventory. In short, these new Department initiatives should continue to allow us not only to obtain spares less expensively but also improve the quality and availability of parts of our soldiers, sailors, airmen, and marines who need them to maintain the readiness of their equipment.

DUAL SOURCING

Senator DIXON. In the time you have been around, are you impressed with dual sourcing?

Dr. COSTELLO. I am impressed with dual sourcing, but I do not think that is necessarily my definition of "competition." I think that our competition may be outside of this country, and we have got to see what the costs are in those competitive roles, and make sure that whatever we put on the table is really competitive worldwide, as opposed to just a couple of bids.

I have had experience in the past where bidding is competitive, and you can control the marketplace with open bids. But then you need to know substantially more about the commodities that you are buying to ensure that you are really getting it at a good cost, and not just at the best price available to you.

We have instituted some programs already to look at commodity buying, and we have one good example of that. That is fuel procurement, which is a worldwide commodity program that I think is

an outstanding program, particularly since fuel is such a volatile commodity.

So I think we are going to try to take some of that experience to look at making sure that the competitive prices we get are really reflecting competitive or worldwide costs.

Senator DIXON. Are you satisfied at least that dual sourcing is superior to sole sourcing? Or is that even arguable?

Dr. COSTELLO. I have had examples where I have been able to, by going to sole sourcing, reduce the cost of an item by 50 percent because I was able in the past to increase, and this is certainly pertinent to this committee, the production to the level where the capital investment necessary to mechanize the system was affordable and substantially reduced the cost.

So, I cannot give you a blanket answer that I think is the best; or I cannot give you a blanket answer that is not adequate. You really have to be intelligent and knowledgeable about the commodities to know where you stand. I think some of both is important to us.

Senator DIXON. That is all, Mr. Chairman.

Senator LEVIN. Thank you, Senator Dixon.

5-YEAR REAL GROWTH BUDGET

We have been submitted a budget which assumes real growth over the next 5 years at 3 percent per year. On that assumption, the assumption that is in your budget request, do you think that we have adequate funds in the outyears to pay for all the new starts in this budget request without worsening the already low and inefficient production rates that we have?

Dr. COSTELLO. I am not in a position to give you an answer to that. If you would please allow us to provide that information for the record. The answer has been looked at, but I am not sure what degree of scrutiny it has presently received.

Senator LEVIN. If you could give us that answer for the record.

[The information follows:]

OUTYEAR FUNDING

Dr. COSTELLO. The acquisition system that Mr. Godwin (Under Secretary of Defense for Acquisition) is setting up will include an effort to review outyear plans in enough detail to answer this question with some specificity. I am confident that these considerations will be taken into account.

Senator LEVIN. Even more important than that answer is the extent you are going to be able to work with us as we go through this budget process. Your budget request assumes a 3-percent real growth.

Assume the Budget Committee in the budget adopted by the Congress provides for zero real growth, just picking a number out of the air, that is going to affect the answer to that question. It would seem to me that you could be extremely helpful if you would tell us in your view what the impact will be in terms of greater inefficiencies on particular systems after we adopt a particular budget number.

I know you will not be supporting that budget number. The administration supports its budget request. That is understandable. But at some point in the next month or so we are going to be adopting a budget number for defense, and that number is going to

have an impact on the outyears' efficiencies. Where we can use your help would be in projecting what those inefficiencies will be if the Congress adopts an assumption of growth lower than that which is assumed in your budget.

So my question is: Will you be willing to work with us at that point? Or are you going to be telling us, sorry, you made your bed, you lie in it?

Dr. COSTELLO. I think there is great reluctance to offer alternatives because the level of communications says that if I do that I have a smaller budget than I can live with.

Senator LEVIN. If I can interrupt you, we are not talking about alternatives here. Let me make sure you understand the question.

Under my assumption in question, Congress has acted. The question would be: Would you then tell us that if you had acted under a zero percent real growth, for instance, if that is what the Congress adopts, this is what the stretchouts would have looked like in your budget request?

It is not alternatives I am seeking, it is facts. What would your budget request look like in outyear production rates if you operated on zero percent real growth, or whatever the real growth figure is that Congress adopts, assuming it is less than 3 percent.

Will you crunch those numbers for us and give us your view as to what they would have been if you had acted on that different assumption?

Dr. COSTELLO. It may be the luck of the Irish has run out. I am not sure how to answer you. [Laughter.]

Let me see if I can phrase an answer that says I think we have to work that way together. We have to find a mechanism for sharing that insight so together, we can structure a significant program that has the least detrimental impact on the defense posture for which we are both searching.

Senator LEVIN. That is helpful.

Dr. COSTELLO. I do not know what the mechanism is, sir.

Senator LEVIN. That is helpful that you express the desire to seek it, because it is a little bit different from what I asked before.

What I am saying is now we have put ourselves in a position, rightly or wrongly. That is the assumption. We have acted. Some of us indeed will be supporting a reduction in the real growth of defense—some of us on this committee, particularly those on the Budget Committee, but a number of us will be. Given the constraints we are operating under, the $108 billion deficit, the unwillingness of the administration to support any revenue, and the reluctance as a result of Congress to support any revenue, rightly or wrongly, I happen to think wrongly, we are going to make a decision.

It would seem to me that you could be very helpful to us, and it would be totally consistent with your own view, to tell us that if you had operated under that assumption of whatever growth rate the Congress adopts, you would have said this is what will happen to your outyear production rates in a number of systems.

Because we then will have adopted a particular assumption. We are going to have to live with that assumption in Congress. It seems to me we can either do it sensibly from that point on—I am

not saying you would agree that that point was reached sensibly—and your analysis can help determine that.

You would not be viewed as participating in the decision to have gone to the zero or whatever number we adopt. That will have already been done. So I really hope that you will give a lot of thought to this, because within our deliberations it becomes critical. We are going to have to decide, given the number handed to us by the Budget Committee and by the Congress, where we are going to delay, where we are going to kill programs, or where we are going to stretch out, and what our priorities are. And for Heaven's sake, I would think your objective analysis, particularly in outyears in that area, would be extremely helpful to us and totally consistent with your own duty of loyalty to the administration's 3-percent number.

So we will look forward, hopefully to your finding that mechanism. I do not know that that has to be particularly subtle, or backdoor, or indirect in that case. It would seem to me that is something you may be able to be very open and direct with us on. But in any event, if you would start searching, because we are obviously going to be in that position. Nobody I know of is predicting that we are going to have a 3-percent real growth number in defense. So we are going to be in that position and we might as well all start looking for a way to get the value of your office's contribution to that fact of life which is going to be on us within a month or so, whatever the figure ultimately is.

Dr. COSTELLO. I think the staff of the Senate Committee has already indicated that they would like to approach those kinds of exchanges, and I think we need to work on them aggressively.

[The information follows:]

PRODUCTION RATE ANALYSIS

All programs presented in the budget are in response to a specific threat with which we expect to be faced—that is why the programs are in the budget request in the first place. The Department has presented a sound and balanced request and urges the support of the Congress. I am not in a position to offer you that sort of analysis; the administration's request is the product of detailed review and evaluation and I stand by that review.

This is not to say that I do not want cooperation between the Department and the Congress. Ideally, the Congress and the Department should work together to ensure a steady level of growth. Constant fluctuations in budget growth projections contribute to program instability and make long range planning very difficult. A firm commitment to steady defense growth would make both of our jobs much easier.

Senator LEVIN. Well, I hope that that will be an automatic, that you will start looking now for the mechanism as a standby mechanism, and that when you know what the number is you will put into place an operation which can get us an analyses which will help this committee pick and choose between various options.

Dr. COSTELLO. I think the interchange is a necessity.

Senator LEVIN. Well, thank you very much, Dr. Costello. We are delighted you have been confirmed, and we look forward to working with you in the future.

Dr. COSTELLO. I appreciate your personal attention to all of these things, my confirmation included, sir.

Senator LEVIN. Thank you.

Our next witness is Robert F. Hale, who is the Assistant Director of the National Security Division of the CBO. Mr. Hale, I think you may have somebody with you. Perhaps you could introduce him.

STATEMENT OF ROBERT F. HALE, ASSISTANT DIRECTOR, NATIONAL SECURITY DIVISION, CONGRESSIONAL BUDGET OFFICE, ACCOMPANIED BY DR. R. WILLIAM THOMAS

Mr. HALE. Yes, Dr. Bill Thomas, who did much of the work I am going to present, Mr. Chairman.

Shall I go ahead?

Senator LEVIN. Please. We welcome you to the committee and thank you for your attendance here today. You have a long and detailed statement and it is a very excellent statement.

Mr. HALE. I will summarize it.

Senator LEVIN. We will put it in the record for you in full, and ask that you summarize.

Mr. HALE. Thank you. I am pleased to be here also to testify on the pace of weapons production in DOD. As I think you know, Mr. Chairman, many DOD weapons are procured at rates well below the maximum. Higher production rates would offer some important advantages. I am going to talk about them.

They also have some potential disadvantages. Thus, the choice of how fast to produce DOD weapons involves some trade-offs. What I am going to do is illustrate them for you. I want to reassure Senator Shelby, in his absence, that I will not recommend all those things that he listed, although I will discuss those alternatives.

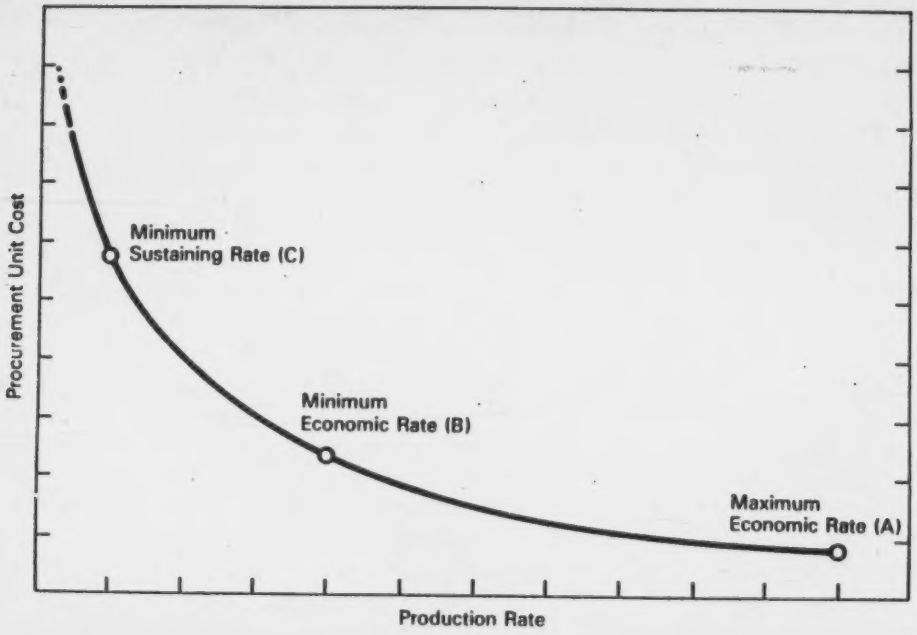
Senator LEVIN. By the way, while you are making reference to the questions, I wonder if you could clarify the question of your clearance and your staff's clearance.

Mr. HALE. We all have clearances, although none of the information I am presenting today is classified.

Senator LEVIN. Thank you.

Mr. HALE. What constitutes a low rate of production? I would like to use some charts for a moment, if I might, to help you here. I want to define the target rates that DOD uses in discussing production rates.

DEFINITIONS OF ECONOMIC PRODUCTION RATES



I have a chart that shows production rates on the horizontal axis, and unit cost of procurement on the vertical axis. It shows the typical relationship –as you increase production, you tend to get lower unit costs.

DOD defines three target rates that I am going to be talking about today: first, the maximum economic rate, defined by existing plant capacity, tooling, or test equipment. It is a physically defined rate usually associated with the lowest unit cost.

At the other end of the spectrum is the minimum sustaining rate, defined as the level that will reasonably sustain an active production base—usually at a fairly high rate of cost—and often associated with one shift of workers working five days a week, eight hours a day.

In the middle of this range is the minimum economic rate, essentially the point where this curve levels off, or further improvements in production rates do not yield much in the way of reduced unit costs.

There is a lot of judgment in attaching numbers to these rates. We have taken DOD's judgments as to production rates.

To assess what has happened historically we looked at 40 systems in procurement. We looked at their average production rates from 1983 to 1987 and compared them with these target rates. Nineteen of those systems were produced at rates that exceeded the minimum economic rate, so we were operating somewhere in this [indicating] range on the curve.

A number of major programs were in that category: the C–5, the Navy Sparrow program, the M1 tank, all were in that range from 1983 to 1987; but 21 of the systems, slightly more than half, were

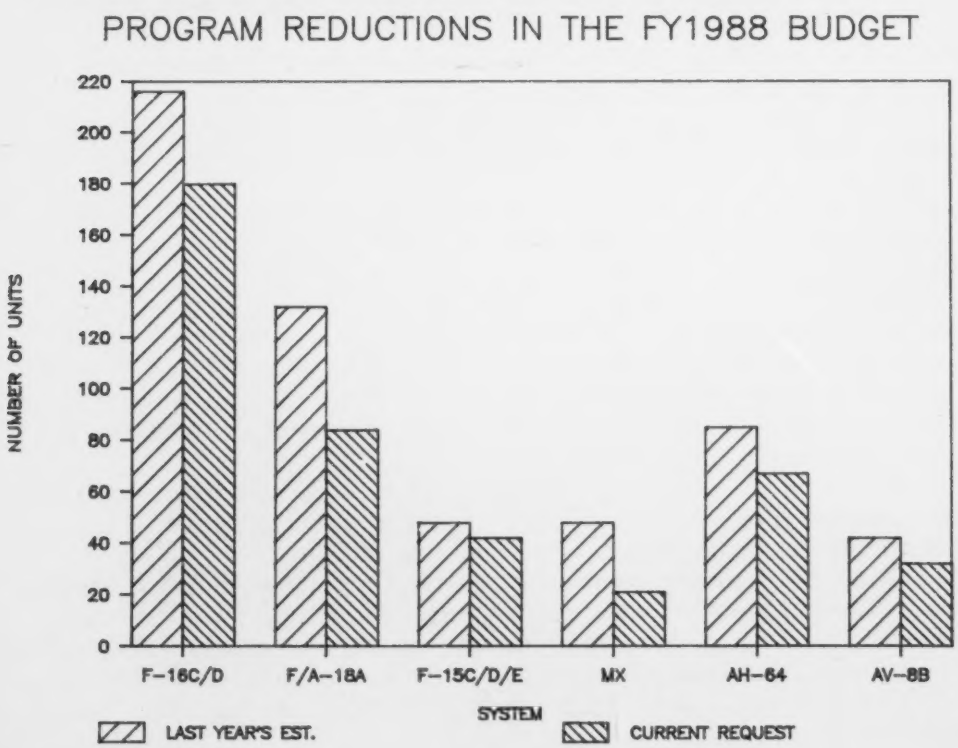
below the minimum economic rate, or down here [indicating]; and 9 of those systems during at least 1 year from 1983 to 1987 were actually below the minimum sustaining rate. So we are back in that very steep portion of the unit cost curve.

I think the best way to summarize it for you is to look at average production, 1983 to 1987, and compare to the maximum economic rate. That is probably the best defined of these rates, because it is physically defined. Some of these weapons we never produced, or hardly ever produced, at the maximum rate. I did not even put the chart up to 100 percent in this case.

Some systems are at 60 percent and 70 percent of maximum rate. Many are at the 20 percent and 30 percent rate. Looking at all 40 systems, we examined over 1983 to 1987, their average was about 50 percent of the maximum economic rates. So we were well below the maximum rate.

Now DOD does not plan to produce at low rates, usually, as has been brought out here. Program managers generally plan to produce at higher rates, but there are stretchouts. We have heard about them today. I will not belabor them except to say that for the 40 systems that we examined, we looked at their original plans in 1983, and then what we actually procured, and average procurement was about 84 percent of the average of the original plans.

For 12 of the 40 systems, procurement fell by one-third or more below the original plans. Finally, if I could get the next chart.



Senator LEVIN. Excuse me. Would you just repeat that last sentence.

Mr. HALE. We do not normally plan to produce at these lower rates, but there are stretchouts. Of the 40 systems we looked at, we went back to the original plan for the period 1983 to 1987. We produced, on average, at 84 percent of that original plan for all of these systems and for 12 of the 40 production was one-third or more below the original plan.

As has been brought out before, DOD's latest budget request essentially continues these trends. Of the 20 largest DOD weapons, 10 of them are being produced at rates lower than were planned a year ago, and I have listed some examples on this chart. The light bar shows what we were planning to produce a year ago. The darker bar is what we are planning to produce now for 1988. Thus, there are a number of stretchouts in this budget.

Four of those requested rates in 1988 would put the systems below their minimum sustaining rate. So we are back on that very steep portion of the unit cost curve that I showed you a monent ago. Clearly there is a pattern of relatively low production rates in DOD.

Should DOD produce weapons at higher rates, there are some disadvantages that must be weighed against the merits of the higher rates. Higher production rates save money in the long run, but they cost more up front. Most likely in this period, these costs are going to have to be offset, perhaps by cancelling existing weapons systems, or deferring weapons.

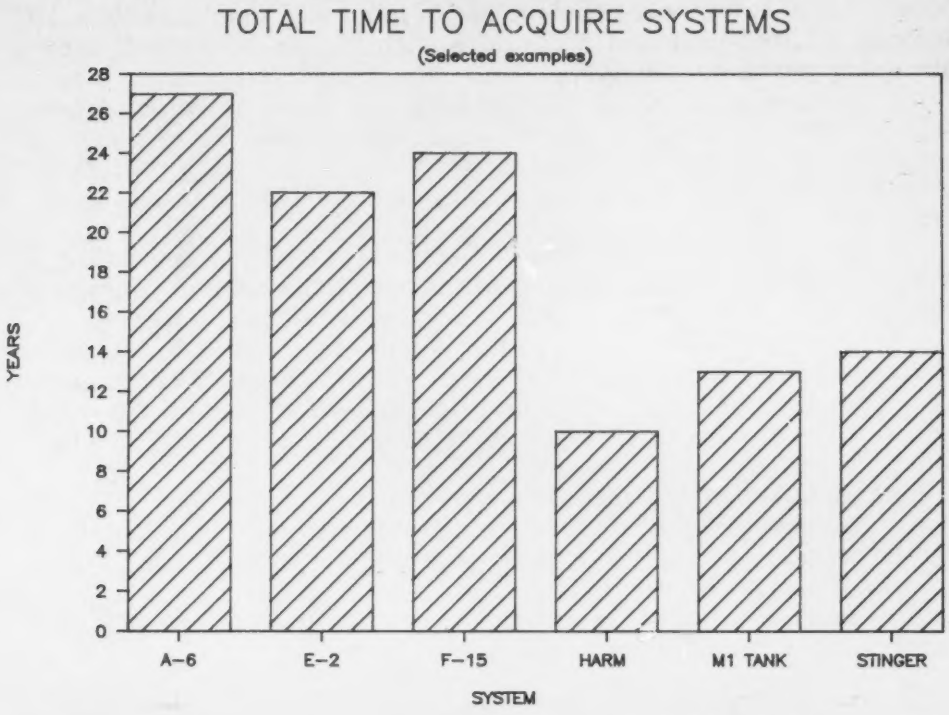
Deferring weapons means that you delay getting the weapons that are most technically advanced in the hands of our forces. I think this is clearly the single most important disadvantage of higher production rates. Higher production rates could also interfere with development of a second contractor for weapons programs, even though experience has shown that competitive pressure often leads to lower prices.

There is also a tradeoff here between competition through dual sourcing and fast production that I am not going to try to go into, but I think that tradeoff is evident.

Higher production rates also increase the likelihood of a production gap, because procurement of one generation of weapons may end before development of the next generation is completed. Yet, in order to facilitate transition to that next generation of weapons, it is very useful to have accumulated knowledge and skills of the engineers and production people still available.

Now these are some disadvantages. There are also some compelling reasons for DOD to support higher production rates. Higher rates mean more systems can be deployed sooner.

Theater commanders emphasize—and they have done it before this committee—that they are short of critical war stoppers, modern munition capable of blunting an enemy attack. They explicitly mention items like Sparrow, Sidewinder, Maverick, HARM, and MLRS, systems for which production rates are an issue. Can I have the next chart.



Higher production rates would also limit the effects of technological obsolescence that can overtake a weapons system before large numbers are in the hands of U.S. forces. This chart shows you the total years from the time we began production to the time that we will finally meet all DOD's objectives for a weapons system. We are assuming here that we continue producing at the planned 1989 rates.

If those planned rates continue, it will have taken an average of 16 years since production began to meet DOD's objectives for acquiring the systems that we examined—there were 27 of them in this case. For 6 of those 27 systems that we examined, it would take 20 years or more, and you can see 3 of those examples that are listed on this chart for you: the E-2, F-15, and A-6 aircraft all fall in that category.

Completing acquisition of these systems sooner would make room in future budgets for new weapons that are technically more advanced.

Finally, higher production rates also tend to lower unit costs. The CBO estimated the effects of reduced rates on the real or inflation adjusted unit costs for 13 selected missile and aircraft systems. We found that increasing production rates by roughly 50 percent would decrease real unit costs by from 5 percent to more than 25 percent, depending on the weapons system. Table 3 on page 13 of my prepared statement shows the specific results of that cost analysis.

Unit cost reductions result from a combination of factors. They are realized by spreading fixed production costs over a larger number of units. I think that is what most of us think of. Econo-

mies result from quantity discounts on purchases of parts and components, and from more efficient use of labor and machines. Not all systems showed unit cost reductions with higher production rates, but many did in our analysis.

Mr. Chairman, as my discussion suggests, there are many tradeoffs involved in electing higher production rates. More weapons would be in the hand of fighting forces at lower costs, but near-term costs would be larger, which might require such things as deferral of new weapons.

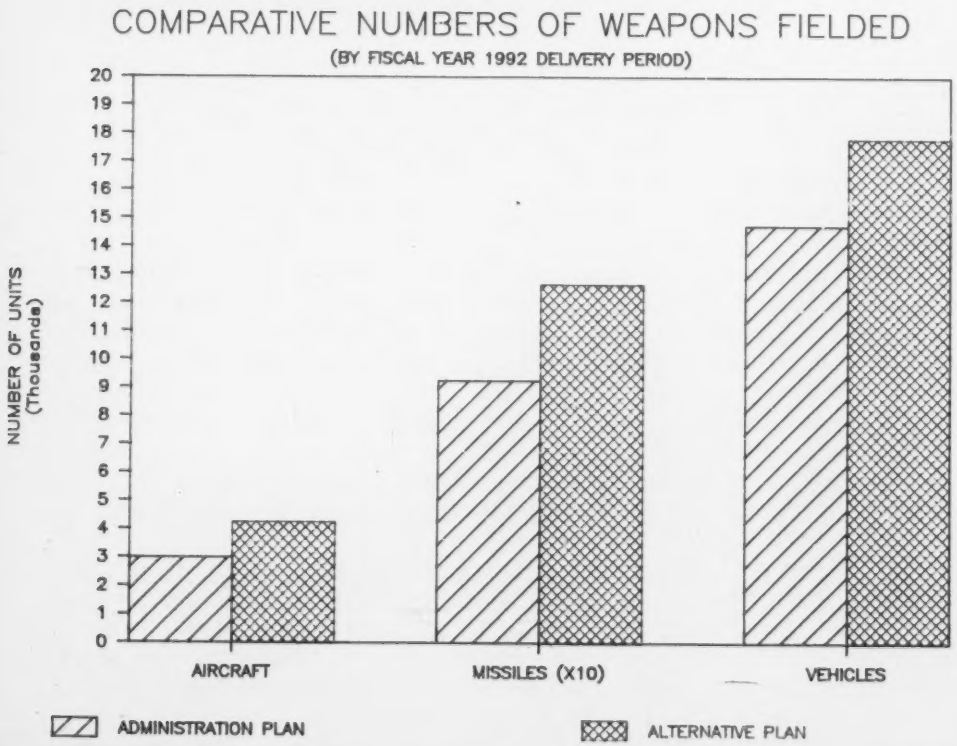
I want to illustrate all these effects for you by formulating a budget alternative which assumes that over the next five years production rates for 12 major DOD weapons would be increased significantly. The 12 illustrative systems—and they are listed in table 4 of page 16 of my prepared statement—cover all the military services. They include 2 aircraft, 3 helicopters, 5 missiles, and 2 combat vehicles. Let me conclude my statement by discussing this alternative with you.

Senator LEVIN. What page was that on?

Mr. HALE. Page 16 of my prepared statement shows the details. I will be showing you some examples here, Senator.

Senator LEVIN. I have it. Thank you.

Mr. HALE. Increasing production rates of these weapons would make many more of them available to U.S. forces.



The lighter bar on this chart shows how many of these weapons—I have grouped them here into major categories, aircraft, missiles, and combat vehicles—you would get under the administra-

tion's plan for the next five years. The larger and darker bar shows how many you would get under the alternative I am discussing.

Compared with the administration's plan for the next 5 years, the alternative would buy an additional 1,263 modern aircraft, 34,252 latest generation missiles, and 3,109 new combat vehicles. Many of these systems have been cited by unified commanders as critical items in short supply.

These faster purchases would speed attainment of service goals for modernizing and sustaining U.S. forces. For example, the alternative plan would attain the Army's entire goal for attack helicopters by 1992 because it buys 86 percent more Apache helicopters than the administration plans to buy. Increasing M1 purchases would mean that 95 percent of the M1 tank objective would be met, compared with 76 percent under the administration's plan. And other systems show similar results.

The total cost of buying the weapons would also be less under this alternative than the cost of buying the same number at the administration's planned lower rates. My earlier discussion of unit costs suggests that costs could be lower by between 4 percent and 50 percent, depending on the system. While it is eventually cheaper to buy at higher rates, more funding is required in the near-term, and here comes the bad news.

In this period of fiscal restraint, these added costs would almost certainly have to be offset by other policy changes. It seems likely the bill might have to be paid by deferring systems that are just beginning to be developed or procured, although I want to hasten to add that you could do it other ways.

In the latest administration budget, 15 major systems have initial procurement funds either in 1988 or 1989, while 13 have initial research and development funds in those years. Deferring all of these systems for 2 years would more than offset the added costs of accelerating production under this alternative. Indeed, there would be a net saving of about $3 billion over the 5-year period, almost all of that in 1988.

Now to avoid terminating programs that are deferred under this option, we have assumed that research and development programs are maintained at current funding levels. So you have the option to go on with them after this deferral period, but I do not want to mislead you. The deferrals would have important effects on major new systems such as the SSN-21 submarine, the C-17 aircraft, and the Army's new Air Defense System. The very last page of my statement, page 26, lists the systems that we have assumed are deferred.

Let me just list a couple of the disadvantages of these deferrals. Deferring production could introduce some inefficiencies of its own if work had to proceed at less than an optimum pace. We would buy fewer of the systems by 1992. Perhaps most importantly, the deferrals would delay the planned buildup in these weapons by two years, and so would postpone the benefits of getting that advanced technology.

Thus, I think the illustrative example highlights the trade-off you face: Maintaining higher production rates for current weapons may well delay the benefits of the newest technology for a few years, but this disadvantage has to be weighed against the disad-

vantage inherent in current plans that produce at low rates. These plans leave today's forces with many old weapons, while waiting until the budget will permit the newest weapons to be purchased in large numbers.

Let me just summarize for you, Mr. Chairman. DOD often buys below target rates. That situation continues into the 1988 budget, and it could get worse if overall budget limits hold down future defense spending. Higher production rates do require more near-term money. That would almost certainly necessitate some offsetting policy changes that I have discussed.

I think this disadvantage has got to be weighed against the clear advantages offered by higher production rates. You get weapons in the field more quickly and replace old systems with reasonably modern ones, while also lowering the unit costs of production.

That completes my oral statement. Dr. Thomas and I would be glad to answer your questions.

[The prepared statement of Mr. Hale follows:]

PREPARED STATEMENT OF ROBERT P. HALE
Assistant Director
National Security Division
Congressional Budget Office

Mr. Chairman, I am pleased to be here today to testify for the Congressional Budget Office (CBO) on the pace of weapons production for the Department of Defense (DoD). My testimony presents preliminary results of a study being done at the request of the present Committee Chairman.

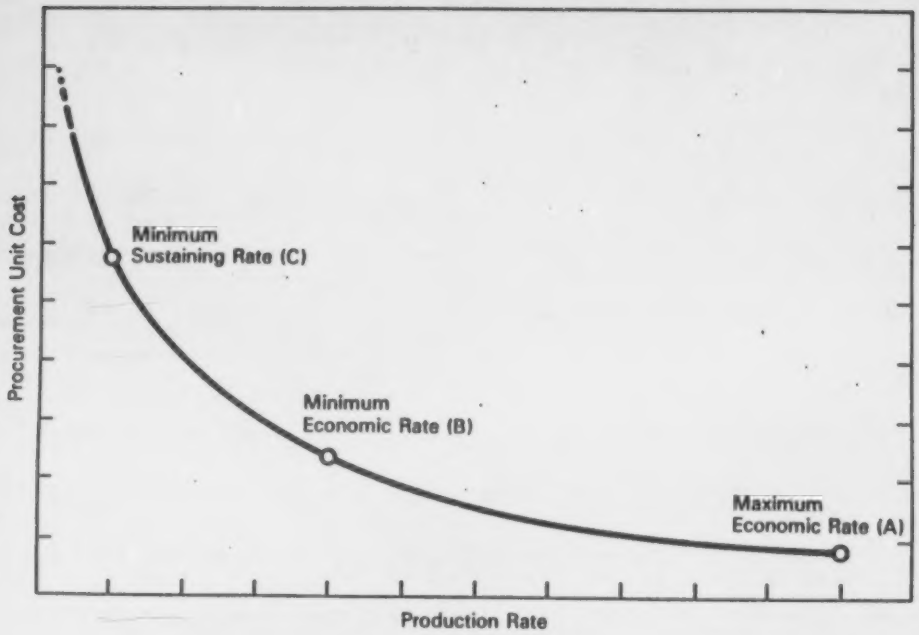
Many DoD weapons are currently being procured at rates well below maximum. Higher production rates would offer important advantages: more weapons would get into the field more quickly, and unit and total program costs would be lower. But higher production rates also have some potential disadvantages. Key among them are higher near-term program costs. These costs would probably require offsetting budget reductions, including perhaps the deferral for a few years of new weapons systems with accompanying delays in the benefits of their new technology. Thus, the choice of how fast to produce DoD weapons involves trade-offs. My testimony will illustrate the nature of these trade-offs--quantifying them where possible.

PRODUCTION RATES IN RECENT YEARS

What constitutes a low rate of production? DoD defines three rates of production:

- The maximum economic rate (point A in attached Figure) is defined as the highest rate of production permitted by existing (or planned) plant capacity, tooling, or test equipment.

DEFINITIONS OF ECONOMIC PRODUCTION RATES



- The minimum economic rate (point B) is the lowest production rate that still offers an acceptable rate of return on the investment made by the contractor and the government; it is usually not the point with lowest unit cost, however, since unit costs generally decline until the maximum rate is reached.
- The minimum sustaining rate (point C) is the lowest production rate that can maintain an active production base and is often associated with the minimum production using one shift of workers five days a week, eight hours per day.

Attaching specific rates to each of these definitions involves considerable judgment, particularly for the minimum economic rate. (Indeed, DoD has decided not to require the reporting of minimum economic rates in the future.) CBO has used the judgments of the services about these rates in its analysis of past procurement trends.

For 40 major weapons systems, CBO compared actual production in 1983 to 1987 with these three target rates. There were indeed cases where production was undertaken at or above DoD's definition of minimum economic rates. Nineteen of the 40 systems (48 percent) had average rates of production that met or exceeded their minimum economic rate over the five years. Most of these systems are listed first in Table 1 and include such programs as the M1 tank, Bradley Fighting Vehicle, Apache helicopter, F/A-18 aircraft, Sparrow missile, B-1B bomber, C-5B transport, and the F-16 aircraft. Fifteen of these 19 systems were bought at or above their minimum economic rate in every year of the 1983-1987 period. (Since it normally takes some time for a production program to reach its economical rate, CBO overlooked low rates in the first two years of production in this and subsequent assessments.)

TABLE 1. PRODUCTION RATES OF SELECTED WEAPONS, ACTUAL AND TARGET

	1983-1987 Annual Procurement Rates			Minimum Sustaining Rate	Minimum Economic Rate	Maximum Economic Rate
	Minimum a/	Maximum	Average a/ b/			
Systems Bought at Higher Than Minimum Economic Rate						
AH-64 Apache Helicopter	112	138	117	24	72	144
M1 Abrams Tank	720	855	825	360	720	1,080
M2 Bradley Fighting Vehicle	600	716	647	336	540	792
Patriot Missile	287	700	485	240	240	840
Stinger Missile	1,956	6,250	3,539	1,300	1,800	11,520
F/A-18 Aircraft	84	84	84	36	84	168
Standard Missile 2 c/	1,150	1,384	1,238	N/A	840	1,324
Sparrow Missile d/	1,700	2,445	2,015	600	1,200	3,804
B-1B Bomber	10	48	31	12	24	48
C-5B Transport	8	21	15	4	4	24
F-16 Aircraft	120	180	156	72	108	324
Hellfire Missile d/	4,870	7,304	6,131	1,200	1,600	6,720
Multiple Launch Rocket System	21,821	72,000	49,905	24,000	36,000	72,000
F-14A Aircraft	15	24	21	12	12	96
KC-10 Tanker/Cargo Aircraft	8	12	9	8	8	24
Systems Bought Below Minimum Economic Rate						
AV-8B Aircraft	21	46	34	30	36	72
A-6E Aircraft	6	11	8	6	12	72
F-15 Aircraft	36	48	41	48	120	144
Ground Launched Cruise Missile	76	120	99	120	120	600
Harpoon Missile	98	354	267	180	360	660
MX Missile	12	21	17	12	21	48
P-3C Aircraft	8	9	8	6	16	24
Phoenix Missile	108	286	222	108	240	420
SH-60B Lamps Helicopter	17	27	21	21	60	60
Tomahawk Missile	51	316	184	120	300	540

SOURCE: Compiled by the Congressional Budget Office from Department of Defense, Procurement Summary (P-1), various years.

a. Excludes initial two years of production.
b. Average over years within the period 1983-1987 when the system was actually procured.
c. Combined procurement of medium-range and extended-range versions.
d. Combined procurement of all services.

On the other hand, only four of the 40 systems ever reached their reported maximum economic production rate and then for only a few of the five years examined. Indeed, for the systems shown in Table 1, production averaged only about 50 percent of the maximum rate.

Moreover, fully 21 systems (53 percent of the 40) reviewed by CBO were procured at average rates below their minimum economic rate, and 9 of these 21 systems never achieved their minimum economic rate in any year during the 1983 to 1987 period. This number would be higher except that minimum economic rates reported by the services are sometimes very low. For example, the Navy reported that the minimum economic rate for three aircraft--the E-2C Hawkeye, EA-6B Prowler, and SH-2F Seasprite--is only six per year.

Finally, procurement rates for certain systems sometimes fell below their minimum sustaining rate. Nine of these 40 systems were procured at levels below that rate during at least one year in the 1983 to 1987 period.

These low rates run counter to DoD policy. In 1981, DoD put forth a set of directives collectively known as the Department of Defense Acquisition Improvement Program (better known as the Carlucci Initiatives). One of these initiatives was to achieve more economical rates of production for selected systems. Of the 40 systems CBO reviewed, 32 were on DoD's target list.

The low rates also occurred despite a relatively favorable budget climate. Over the 1983 to 1987 period, total funds appropriated for the procurement of weapons systems increased greatly compared with the preceding five-year period. In constant 1988 dollars, funds in 1983 to 1987 were 73 percent greater than those in 1978 to 1982 (for details, see Table

A-1 in the appendix to my testimony). Weapons were also procured in greater numbers than in previous years, though percentage increases in numbers were often less than those in dollars. Nonetheless, rates of production were frequently quite low, suggesting that this problem will get worse if budget growth remains low or even negative.

Program managers generally planned to procure systems at higher rates, but program stretch-outs were common. For the 40 systems discussed above, CBO examined production in 1983 to 1987--first as DoD planned it in 1983, then at the levels DoD requested in each of the years, and finally at the levels actually produced (Table A-2 shows details). As DoD revised its budget each year, procurement of many systems tended to fall from planned levels. On average, DoD asked the Congress to approve production of only 88 percent of what they planned to buy as of 1983. Actual procurement averaged 84 percent of those original plans. For 24 of the 40 systems, the sum of DoD's requests fell below its plans as of 1983--and sometimes well below.

Failure to meet planned rates in some cases resulted from developmental or production problems. The AMRAAM missile, for instance, was delayed two years in development; production of several missiles was halted to resolve quality control concerns. In many other cases, budget cuts probably led to the stretch-outs.

DoD's latest budget request shows more examples of rate cuts. Of the 20 largest DoD weapons programs, 10 have requested rates in 1988 that are lower than planned as of a year ago. Four of those requested rates would put the systems below their minimum sustaining rate.

PROS AND CONS OF HIGHER PRODUCTION RATES

Should DoD produce weapons at higher rates? Certain disadvantages must be weighed against the merits of higher rates.

Disadvantages of Higher Production Rates

The most imporant disadvantage of higher production rates is the delay or cancellation of new weapons systems that would almost certainly be needed to pay for the higher rates. As I will note later, higher production rates often lower the cost per unit of a weapon. But producing 100 items rather than 50 in a particular year will almost always increase the total funding required in that year. Even if unit costs are lower, the higher numbers more than offset reduced costs per weapon. With a fixed budget, these higher program costs would have to be offset. That could be accomplished by reducing numbers of forces or readiness, but such a proposal seems unlikely to find favor. More likely, added costs would have to be offset by canceling or deferring new weapons. This approach would delay putting those new weapons--which are almost always technologically more advanced--in the hands of U.S. fighting forces.

Higher rates have other potential disadvantages as well, though they often apply only in specific circumstances. DoD has been emphasizing the development of a second contractor for many missile programs, since experience has shown that competitive pressure often leads to lower prices. But this policy requires diverting orders from the first contractor to qualify the second source, reducing the production rate for the former just when it has the potential to shift to a high rate of production. A comparison of savings using a second source with the potential savings from higher

production rates is a subject for separate analysis, but the trade-off is evident.

Higher production rates may also increase costs of modifications. Even a successful weapons system undergoes many modifications over its lifetime. It is usually cheaper to incorporate these modifications as units are produced. With high production rates, more systems may have to be recalled for modifications, a costly procedure. High production rates also limit the option to cancel a system if, for example, it became obsolete.

Finally, high rates may make it more difficult to maintain active producers. Higher production rates mean shorter production periods, if acquisitions are fixed. Shorter periods would increase the likelihood of a production gap, because procurement of one generation of weapons might end before development of the next generation is completed. Yet, in order to facilitate transition to the next generation of weapons, it is important to keep together the accumulated knowledge and skills of engineers and key production managers. The ideal solution, of course, would be to buy existing systems quickly and efficiently and then move on to new ones. Short of this, foreign military sales might help to fill production gaps without sacrificing production efficiency.

Advantages of Higher Rates

While there are disadvantages to higher production rates, there are also compelling reasons for DoD to support them. Higher production rates mean more systems could be deployed sooner. Theater commanders emphasize that they are short of critical "war-stoppers"--modern munitions capable of

blunting an enemy attack. They explicitly mention items such as the Sparrow, Sidewinder, High Speed Antiradiation Missile (HARM), Maverick, MLRS--systems for which production rates are an issue.

Higher production rates would also limit the effects of technological obsolescence that can overtake a weapon system before large numbers are in the hands of U.S. forces. Table 2 shows the number of years that would be required to meet DoD objectives for acquiring 26 selected weapons systems assuming that procurement rates planned for 1989 continue. The table also shows the number of years these systems have already been in production. If planned 1989 rates continue, it will have taken an average of 16 years since production began to meet DoD's objectives for acquiring these systems; for 6 of the 27 systems, it would take 20 years or more. While many of these systems have been modified during these long

TABLE 2. YEARS TO ACQUIRE SELECTED MAJOR WEAPONS SYSTEMS

System	Total Program Quantity	Needed to Complete	Years in Production	Procurement Rates 1988	Procurement Rates 1989	Years to Complete a/	Total Years
AMRAAM Missile b/	24,320	24,140	1	630	1,800	14	15
AV-8B Aircraft	328	148	6	32	32	5	11
A-6E/F	345	150	18	12	18	9	27
CH/MH-53E Helicopter	153	32	11	14	14	3	14
E-2C Aircraft	141	30	18	6	6	5	23
EA-6B Aircraft	80	42	4	6	9	5	9
F-14A/D Aircraft	710	132	17	12	12	11	28
F-15A/D/E Aircraft	1,266	342	15	42	42	9	24
F-16A/B/C/D Aircraft	2,729	1,230	10	180	180	7	17
F/A-18 Aircraft	1,157	580	9	84	72	8	17
HARM Missile b/	14,619	7,098	7	2,514	2,659	3	10
Harpoon Missile	3,971	886	13	124	138	7	20
Hellfire Missile c/	48,696	27,614	6	5,000	4,000	7	13
IIR Maverick Missile d/	60,664	50,744	6	2,100	1,900	27	33
M1 Tank	7,844	2,086	9	600	534	4	13
M2 Fighting Vehicle	6,582	2,549	8	616	616	4	12
Multiple Launch Rocket System	440,322	180,000	8	72,000	36,000	4	12
MX Missile	223	157	4	21	21	8	12
Patriot Missile	5,452	3,602	8	715	815	5	13
Phoenix Missile	7,204	5,904	8	430	560	11	19
SH-60F Aircraft	175	168	1	18	18	10	11
Standard Missile 2	14,677	9,375	12	1,150	1,635	6	18
Stinger Missile c/	50,370	31,631	10	4,200	5,000	7	17
Tomahawk Missile	3,994	2,958	8	475	510	6	14
TOW 2 Missile c/	125,856	48,623	7	9,416	8,719	6	13
UH-60 Helicopter c/	1,111	252	11	61	72	4	15

SOURCE: Computed by the Congressional Budget Office based on DoD data contained in Congressional Data Sheets, Selected Acquisition Reports, and Procurement Summary (P-1).

a. Based on 1989 rate.
b. Combined Air Force-Navy procurement.
c. Army procurement only.
d. Air Force (AGM-65D/G) version only.

production periods, there are limits to what these modifications can do to meet increasing foreign threats. Completing the acquisition of these systems sooner would make room in future budgets for new weapons.

There are also good business reasons for maintaining high production rates. CBO discussed these with a number of defense contractors. They emphasized the following points:

- Once the basic investment in tooling and test equipment has been made, there are clear economies of scale in producing at higher rates.
- Program stretch-outs are disruptive. Sometimes they involve laying off trained and experienced workers. They also add to costs by forcing contractors to store long-lead items already bought. In many cases, engineering changes may make these stored items obsolete or require reworking before they can be used.
- Low production rates limit the incentive to invest in techniques to save labor and material, since it is difficult for the contractor to recover its investment.
- Low production rates discourage potential suppliers and subcontractors from competing for defense business, thus adding to these costs.

All these points suggest that higher production rates could reduce the costs of defense systems. Let me now discuss the potential magnitude for such savings.

ANALYSIS OF EFFECT OF PRODUCTION RATE ON UNIT COSTS

CBO estimated the effects of production rates on the real (inflation-adjusted) unit costs for 13 selected missile and aircraft systems. The analysis relies on results from contractors, the military services, and CBO's own analysis of budget data. CBO found that increasing production rates by 50 percent would decrease real unit costs by from 5 percent to more than 25 percent, depending on the system. In the extreme case, according to the Air Force, unit costs for the MX missile would be reduced by 29 percent, if it were produced at the minimum economic rate of 21 missiles per year (see Table 3). Tactical missiles, such as IIR Maverick and Phoenix, offer potential savings of 12 percent to 20 percent, were production rates increased by 50 percent. Mature aircraft programs, such as the A-6 and F-14, appear to offer lower potential for cost reduction. Even for these programs, however, savings of 5 percent to 10 percent appear feasible if production rates increase by 50 percent.

TABLE 3. ESTIMATES OF THE EFFECT OF PRODUCTION RATE ON UNIT COST FOR SELECTED SYSTEMS

System	Fiscal Year 1988 Quantity Requested	Production Rate Increase		Source for Estimated Rate Effect
		Percent Increase in Quantity	Percent Decrease in Unit Cost	
Aircraft				
AH-64	67	46	5	McDonnell Douglas Helicopter Co.
A-6F	12	50	10 a/	Grumman
C-17	2	50	22	U.S. Air Force
CH/MH-53E	14	43	7	CBO
E-2C	6	50	12	Grumman
EA-6B	6	50	5	CBO
F-14D	7	50	5	CBO
F-15E	42	43	11	U.S. Air Force
KC-135R	36	44	3	U.S. Air Force
Missiles				
AMRAAM	630	33	13	U.S. Air Force
IIR Maverick	2,100	50	12	U.S. Air Force
MX Missile	21	60	29	U.S. Air Force
Phoenix	430	50	19	Hughes

SOURCES: Congressional Budget Office; McDonnell Douglas Helicopter Company; Grumman Corporation; U.S. Air Force; Hughes Aircraft Company.

a. Estimated based on cost relationship for earlier A-6E model.

Unit cost reductions result from a combination of factors. Reductions are realized by spreading fixed production costs (such as plant overhead) over a larger number of units. Economies result from quantity discounts on purchases of parts and components. Labor savings are achieved by assigning a larger crew of workers more specific tasks, allowing them to be more proficient, and avoiding delays associated with changing jobs. Similar savings are possible in the use of machinery, since a larger number of units can be run off more economically once a machine has been set up to perform a given task. If production rates warrant, special purpose machines may be acquired to perform tasks more efficiently than is possible with general purpose tools.

Discounting can offset the unit cost advantages of higher production rates, though usually only partially. Raising production rates involves spending more money now in order to achieve savings later. But future savings are worth less when expressed in terms comparable to near-term costs. Economists usually use the discount rate to achieve this comparability. CBO's preferred discount rate is 2 percent in real terms, which means that $1 saved today is comparable to $1.02 saved next year. At a rate of 2 percent, higher production rates still lead to savings for a number of weapons systems (see Table A-3 for examples). By direction of the Office of Management and Budget, DoD uses a real discount rate of 10 percent in cost-benefit analyses. At that rate, many fewer systems would show long-term savings if bought at higher production rates.

Even ignoring discounting, not all systems showed unit cost reductions with higher production rates. Program managers and contractors supplied CBO with a few examples (the Sparrow missile, KC-135R modification

program) that showed limited effects when production rates were increased. CBO's own statistical analysis of budget data revealed more examples. Indeed, fewer than half the systems CBO examined using budget data revealed significant rate effects, perhaps because these effects are obscured by other factors--such as system modifications and support costs.

A BUDGET ALTERNATIVE THAT ACHIEVES HIGHER PRODUCTION RATES

As my discussion suggests, there are many trade-offs involved in electing higher production rates. More weapons would be in the hands of fighting forces sooner and at lower unit costs, but near-term costs would be larger, which might require deferral of new weapons. To illustrate these effects, CBO formulated a budget alternative which assumed that, over the next five years, production rates for 12 major DoD weapons would be increased significantly. The 12 illustrative systems cover all the services and most major types of weapons; they include two aircraft, three helicopters, five missiles, and two combat vehicles. Table 4 lists the weapons and the increases considered for each.

Increasing production of these weapons would make many more of them available to U.S. forces. Compared with the Administration's plans for the next five years, this alternative would buy an additional 1,263 modern aircraft, 34,252 latest-generation missiles, and 3,109 new combat vehicles (see Table 4). Many of these systems have been cited by Unified Commanders as critical items in short supply.

These faster purchases would speed attainment of service goals for modernizing and sustaining U.S. forces. The alternative plan would, for example, attain the Army's entire goal for attack helicopters by 1992

TABLE 4. COSTS AND EFFECTS OF ACCELERATING PRODUCTION OF SELECTED WEAPONS SYSTEMS
(Costs in billions of dollars)

System	Number of Units Acquired Through 1992		Additional Units Purchased		Added Costs	
	Administration's Plan	Alternative Plan	Number	Percent	1988	1988-1992
		Aircraft				
AH-64 Apache	593	1,102	509	86	0.3	6.0
F-15E Eagle	260	392	132	51	0.5	5.1
F/A-18 Hornet	949	1,157	208	22	0.2	6.0
SH-60F CV Helicopter	85	175	90	106	a/	1.5
UH-60A Blackhawk	1,111	1,435	324	29	0.2	1.6
Total, Aircraft	2,998	4,261	1,263	42	1.2	20.2
		Missiles				
HARM	14,619	23,542	8,923	61	0.2	2.1
Harpoon	3,971	4,599	628	16	0.1	0.6
IIR Maverick	25,820	43,420	17,600	68	0.4	1.6
Standard Missile 2	3,973	4,643	670	17	a/	0.3
Stinger	43,939	50,370	6,431	15	0.1	0.3
Total, Missiles	92,322	126,574	34,252	37	0.8	4.9
		Combat Vehicles				
M1 Abrams Tank	7,844	9,718	1,874	24	a/	4.2
M2 Bradley Fighting Vehicle	6,882	8,117	1,235	18	a/	1.5
Total, Combat Vehicles	14,726	17,835	3,109	21	a/	5.7
Total Cost of All Additional Systems					2.0	30.8

SOURCE: Congressional Budget Office.

a. Less than $50 million.

because it buys 86 percent more Apache helicopters than the Administration plans. (For purposes of determining portions and goals that are met, all weapons purchased by 1992 are assumed to have entered the inventory.) Increasing M1 purchases by 1,874 tanks would mean that 95 percent of the M1 tank objective would be met compared with 76 percent under the Administration's plan. Plans to modernize tactical aircraft forces would be substantially accelerated, often meeting objectives fully by 1992. Accelerated purchases of missiles under the alternative would improve the war reserves of these critical items as well.

The total cost of buying the weapons would also be less under this alternative than the cost of buying the same number under Administration plans. Typically, this alternative accelerates production over planned rates by between 40 percent and 100 percent. The preceding discussion of unit

costs suggests that real costs could be lower by between 4 percent and 50 percent, depending on the system. (These reductions are only partially reflected in CBO's cost analysis because of difficulties of translating the unit cost reductions discussed above into long-term budget plans.)

While it is eventually cheaper to buy at high rates, more funding is required in the near term. In 1988, these higher buy rates would add $2.0 billion to the Administration's budget request. Added costs over the next five years would total $30.8 billion since rates are above Administration plans over the entire period.

In this period of fiscal restraint, these added costs would almost certainly have to be offset by other policy changes. The Congress could offset the budget impacts of higher production rates by canceling other, lower-priority systems. But it is usually hard to do this for systems being produced at full rate. It is more likely that the bill would be paid by deferring systems that are just beginning to be developed or procured. In the latest Administration budget, 15 systems have initial procurement funds either in 1988 or 1989, while 13 have initial research and development funds in those years. Deferring all these systems for two years would more than offset the added costs of accelerating production; savings would total $5.4 billion in 1988 and $32.6 billion over the next five years (see Table A-4 for details). To avoid terminating the programs that are deferred, CBO's estimates of costs assume that research and development programs are maintained at current funding levels for those systems.

Nonetheless, these deferrals would have important effects on major new systems such as the SSN-21 submarine, the C-17 aircraft, and the Army's new air defense system. Deferring production could introduce

inefficiencies of its own if work had to proceed at less than an optimal pace. Moreover, by 1992, deferrals of major systems would have led to the purchase of 291 fewer aircraft, 2,724 fewer missiles, 4 fewer SSN-21 submarines, and 24 fewer landing craft. (For some deferrals, CBO cannot determine the reduction in quantity, since procurement plans are still indefinite or classified.) Perhaps most important, deferrals would delay the planned buildup in these weapons by two years, and so would postpone the benefits of improved technology.

Thus, this illustrative example highlights a key trade-off. Maintaining higher production rates for current weapons may well delay the benefits of the newest technology for a few years. This disadvantage must be weighed against the disadvantage inherent in current plans; these plans leave today's forces with many old weapons, while waiting until budgets permit the newest weapons to be purchased in large numbers.

The trade-off, however, need not be as far-reaching as this alternative depicts. This alternative involves large numbers of deferrals coupled with large increases in production rates. The Congress could garner some of the benefits of higher rates, while also deferring fewer new systems, under a more modest approach that involves fewer systems.

CONCLUSION

In summary, Mr. Chairman, DoD often buys weapons below its target rates. Of 40 major systems examined by CBO, nine had production below minimum sustaining rates sometime in 1983 to 1987; overall production averaged about 50 percent of maximum rates. The situation continues in the 1988 budget and could grow worse if overall budget limits hold down future

defense spending. Higher production rates, however, require more near-term funds. Finding these funds would almost certainly necessitate offsetting policy changes such as the deferral of new weapons, which would delay the benefits of the newest technology for a few years. This disadvantage must be weighed against the clear advantages offered by higher production rates: they get weapons in the field more quickly, replacing old systems with reasonably modern ones, while also lowering unit costs of production.

SUPPLEMENTARY TABLES

TABLE A-1. QUANTITIES AND COSTS OF SELECTED MAJOR WEAPONS SYSTEMS
(Costs in billions of constant 1988 budget year dollars)

Systems	Fiscal Years 1978-1982	Fiscal Years 1983-1987	Increase/ Decrease (-)	Percent Change
		Aircraft		
Fixed Wing Aircraft				
Combat	2,188	2,196	8	a/
Airlift	150	248	98	65
Trainer	177	85	-92	-52
Rotary Wing Aircraft	819	1,378	559	68
Total Aircraft	3,334	3,907	573	17
Total Cost	59.9	106.0	46.1	77
		Missiles		
Strategic Theater Nuclear	1,840	2,425	585	32
Tactical				
Air-launched	24,617	68,060	43,443	176
Surface launched b/	95,564	105,816	10,252	11
Total Missiles	122,021	176,301	54,280	44
Total Cost	23.5	40.0	16.5	70
		Tracked Vehicles		
Heavy Combat Vehicles	4,324	7,358	3,034	70
Light Combat Vehicles	2,872	2,671	-201	-7
Other Vehicles	1,487	2,906	1,419	95
Total Vehicles	8,683	12,935	4,252	49
Total Cost	11.5	18.6	7.1	62
Grand Total Cost	94.9	164.6	69.7	73

SOURCE: Department of Defense Procurement Summaries.

a. Less than 0.5 percent.
b. Excludes MLRS rounds.

TABLE A-2. PLANNED AND ACTUAL PROCUREMENT RATES FOR SELECTED SYSTEMS

System	1983-1987 Budgets				
	Planned Procurement a/	Sum of DoD Requests	Percent of Plan	Quantity Approved	Percent of Plan
EA-6B Aircraft	30	42	140	44	147
P-3C Aircraft	26	38	146	38	146
Sidewinder Missile	8,318	9,827	118	10,611	128
Laser Maverick Missile	3,490	4,155	119	4,175	120
AH-64 Helicopter	435	592	136	515	118
TOW 2 Missile	67,510	95,304	141	77,412	115
E-2C Aircraft	30	30	100	34	113
F-16C/D Aircraft	720	786	109	774	108
KC-10A Aircraft	42	44	105	44	105
UH-60 Helicopter	414	414	100	426	103
Multiple Launch Rocket System	254,112	254,112	100	254,112	100
B-1 Bomber	99	99	100	99	100
C-2A Aircraft	39	41	105	39	100
C-5B Aircraft	50	53	106	50	100
EH-60A Helicopter	66	66	100	66	100
Ground Launched Cruise Missile	495	531	107	495	100
CH/MH-53E Helicopter	61	60	98	60	98
HARM Missile	7,416	8,462	114	7,274	98
Harpoon Missile	1,591	1,489	94	1,335	84
M2 Fighting Vehicle	3,897	3,496	90	3,233	83
M1 Tank	5,096	3,896	76	4,125	81
A-6E Aircraft	52	37	71	42	81
AV-8B Aircraft	216	170	79	168	78
F/A-18 Aircraft	552	456	83	420	76
SM-2 MR Missile	3,750	2,705	72	2,759	74
Sparrow Missile	13,705	9,312	68	10,099	74
F-14A Aircraft	144	105	73	105	73
Hellfire Missile	30,958	23,885	77	22,363	72
Patriot Missile	3,742	2,771	74	2,427	65
SM-2 ER Missile	2,525	1,550	61	1,480	59
SH-2F Helicopter	72	48	67	42	58
SH-60B Helicopter	186	122	66	107	58
Phoenix Missile	1,936	1,268	65	1,108	57
E-6A Aircraft	9	5	56	5	56
Tomahawk Missile	1,720	997	58	928	54
F-15D Aircraft	390	234	60	207	53
Stinger Missile	36,047	20,000	55	17,697	49
IIR Maverick Missile	35,410	18,664	53	10,334	29
MX Missile	226	145	64	66	29
AMRAAM Missile	3,639	524	14	180	5
Average			88		84

SOURCES: Department of Defense, Procurement Summary (P-1) (various years) and Congressional Data Sheets.

a. As of February 1982 Five-Year Defense Plan.

TABLE A-3. EFFECTS OF DISCOUNTING ON COSTS UNDER HIGHER PRODUCTION RATES
(Costs in millions of 1987 dollars)

System	Average Annual Production Rates		Added Costs of CBO Plan	Long-Term Savings				
	January 1986 Plan	CBO Alternative		Gross Savings	Net of Added Costs	Percent of Total Cost of CBO Alternative	Discounted Savings	
							2 Percent	10 Percent
CH/MH-53 Helicopter	14	18	160 a/	280	120	11.3	100	60
F-15E Aircraft	48	84	4,250 b/	4,860	610	4.9	330	-380
F-14D Aircraft	31	56	4,930 c/	5,630	700	5.4	260	-750
EA-6B Aircraft	12	24	730 a/	1,020	290	12.3	240	90

SOURCE: Congressional Budget Office.

a. Through 1989.
b. Through 1991.
c. Through 1994.

TABLE A-4. SAVINGS FROM DEFERRING NEW STARTS
(In billions of dollars)

Program	Savings from a Two-Year Deferral		Reduction in Units Purchased Through 1992
	1988	1988-1992	
Research and Development Programs			
Army RDT&E Programs	0.1	2.0	n.a.
Navy RDT&E Programs	0.3	0.6	n.a.
Air Force RDT&E Programs	2.5	a/	n.a.
Procurement Programs			
Aircraft			
RC-12 Reconnaissance Aircraft	0.1	0.4	19
V-22 Osprey	0.0	4.6	106
P-3G	a/	1.6	50
EX Competition	0.2	0.7	n.a.
T-45 Trainer	0.4	1.4	96
C-17 Aircraft	0.7	4.9	20
Missiles			
Air Defense System, Heavy	a/	0.9	2,724
Non-Line-of-Sight Air Defense System	a/	0.5	n.a.
Small ICBM	a/	5.6	n.a.
Space Defense System	a/	0.9	b/
Ships			
Aircraft Carriers	0.6	2.3	0
SSN-21 Submarine	0.3	4.1	4
Landing Craft, Air Cushion	a/	0.6	24
Other Procurement			
TRI-TAC Equipment	0.2	0.7	n.a.
SINCGARS	a/	0.8	48,500
Total	5.4	32.6	

SOURCE: Congressional Budget Office.

n.a. = not available.

a. Less than $50 million.
b. Number is classified.

Senator LEVIN. Thank you very much, Mr. Hale.

Do you have any way of knowing whether or not the stretchouts that we are facing now are worse than they were say 5 years ago?

Mr. HALE. I do not have any numbers on that. I guess my sense is they are probably not, but I do not have any numbers. I think we were producing at quite low rates in the late 1970s also.

Senator LEVIN. How about say 5 years ago in the early 1980s?

Mr. HALE. I suspect that our rates of production were higher relative to these targets 5 years ago for these systems, even taking into account that some of them were in the early phases of their development then and you really have to throw out the first few years of low rate production. Am I answering your question?

Senator LEVIN. We are operating now with what, 50 percent?

Mr. HALE. That was the average from 1983 to 1987 as a percentage of the maximum economic rate. We may be a little lower than that in 1987 itself.

Senator LEVIN. So if that was the average 1983–87, where would the average be say 1978 to 1983? Do you have any idea?

Mr. HALE. I really do not. My guess is it would not have been all that much different. Bill, do you have any sense?

Dr. THOMAS. I think it is very hard to generalize about all systems. If you are speaking about tactical aircraft, and I am most familiar with their longer-term history, then production rates for those types of aircraft have been secularly falling for quite a long time, perhaps 20 to 25 years.

TERMS OF STRETCHOUTS

Senator LEVIN. Is there any way of telling us whether there is a trend in terms of stretchouts, perhaps system by system. Are we stretching out more or less, or about the same as we were 5 years ago, 10 years ago, whatever? Is there any way without spending months of work that you could let us know that?

When we talk about stretchouts, I view it as a major problem. I know Senator Bingaman and others do. We have spoken about this. Senator Nunn has been talking about this for years. But I do not have a great feel, frankly, as to the trend here.

Dr. THOMAS. Well, Senator, we have a data base on weapons system production that goes back about as far as CBO does, that is to 1974. CBO has very little data before then. Obviously the Department of Defense has all of the data available and with, as you say, a considerable amount of effort we could dig up that information.

Mr. HALE. Let us see what we can get for you.

Senator LEVIN. Yes. See if you can give us some idea.

Mr. HALE. We may have to define it a bit narrowly, if you will permit, but we will give you some kind of time frame.

Senator LEVIN. That will be all right. If you can pick what you think might be a representative area and a representative time frame, it would be helpful to do that.

[The information follows:]

The attached table compares production rates for selected weapons in the period 1983–1987 with rates for the same or comparable weapons in the earlier time period 1976–1980. Based on these data, it is difficult to reach any firm conclusion on whether the problem of low production rates is becoming more or less severe. Of the 31

systems listed, it is true that 20 systems, or 65 percent, showed an increase in the more recent period. Ten of 13 missile programs showed increases in rates. This contrasts with fixed-wing aircraft, where rates declined for 6 of the 12 programs CBO examined. Rates for all three helicopters increased, as did the tank production rate.

COMPARISON OF PRODUCTION RATES, 1983-1987 VERSUS 1976-1980

System	1983-1987 Average Annual Purchases a/	Comparable System	1976-1980 Average Annual Purchases a/	Increase (Decrease) in 1983-1987
		Army Systems		
Hellfire b/	6,131	Dragon b/	23,731	(17,600)
AH-64	117	AH-1T b/	61	56
M1	825	M60 b/	694	131
Bradley Fighting Vehicle	647	M113	962	(315)
Patriot	485	Hawk	472	13
Stinger b/	3,539	Stinger b/	2,366	1,173
Tow II b/	15,482	Tow I b/	14,465	1,017
Blackhawk	85	Blackhawk	64	21
		Navy Systems		
Harpoon b/	284	Harpoon b/	234	50
HARM b/	1,460	Shrike	1,092	368
Phoenix	222	Phoenix	212	10
SM II	848	SM I	449	399
Sparrow b/	2,015	Sparrow b/	1,511	504
Sidewinder b/	2,122	Sidewinder b/	2,270	(148)
AV-8B	34	A-7E	23	11
A-6E	8	A-6E	9	(1)
Tomahawk	186	ALCM	91	95
CH-53E	12	CH-53E	9	3
C-2A	8	UC-12B	22	(14)
EA-6B	9	EA-6B	6	3
E-2C	7	E-2C	6	1
E-6A	3	E-3A	4	(1)
F-14A	21	F-14A	38	(17)
F/A-18	84	A-7E	23	61
P-3C	8	P-3C	13	(5)
		Air Force Systems		
AMRAAM b/	180	Sparrow b/	1,511	(1,331)
F-15D	41	F-15A/D	95	(54)
F-16	155	F-16A/B	142	13
GLCM	99	ALCM	91	8
KC-10A	9	KC-10A	3	6
MX	17	Trident I	78	(61)

SOURCE: Congressional Budget Office from Department of Defense Data.

a. Average excludes initial two years of procurement, if they fall within the period.

b. Joint service procurement.

ACCELERATING PRODUCTION COSTS

Senator LEVIN. Now you have given us in table 4 the added cost. I think it is $2 billion in 1988, the way I read your chart, of accelerating production of certain systems over what is proposed, I gather, that is in the budget?

Mr. HALE. Right. The total cost is $2 billion. You are exactly right.

Senator LEVIN. So if we could invest $2 billion in 1988 dollars in these accelerations, what would we save dollarwise? What is the return on that investment over what period of time?

Mr. HALE. I wish I had an easy answer for you. I am going to speculate. We had a lot of trouble getting these unit cost reductions. Frankly, we ended up relying on a variety of sources of data. You cannot tease them out of the budget data easily. It just did not work. We relied heavily on the contractors and the services.

My sense is that when you increase production rates by about 50 percent, you tend to get—it is the testimony—5 to 25 percent savings, but most of them fall in the 10 percent to 15 percent reductions in unit costs. So I suspect we would be in that range of 5 percent to 10 percent reduction in unit costs, those kinds of numbers.

I would be glad to try to assess return on investment. I do not have a specific estimate for that particular option, but I would be glad to try to work on it for you.

Senator LEVIN. Let me put it in these terms, that a $2 billion investment in those particular systems would save us $2.3 billion. That is the issue. If we spend $2 billion, we want to pick up more than $2 billion.

Mr. HALE. Sure. But understand, it is not as if you are throwing that $2 billion away. You are going to spend that eventually anyway to buy these things.

Senator LEVIN. I understand.

Mr. HALE. It is a question of spending it sooner.

Senator LEVIN. I understand.

Mr. HALE. And not later. So I think what you want to look at is the pattern of costs under the two alternatives and see which is less, probably in some discounted sense.

Senator LEVIN. You are exactly right. Now can you do that for us?

Mr. HALE. Yes, I think we can give it a go.

Senator LEVIN. What does $2 billion save us over time, discounted.

Dr. THOMAS. Senator, we do not have a complete answer for you now, but there are some examples worked out in table A3 which appears on page 25 of the testimony. You will see that discounting is one of the key issues here when you do spend money up front in order to save money later.

For instance, take the F-15E. To buy out that aircraft at a rate of 84 a year instead of 48 would require in the early years additional funds of about $4.2 billion. In the later years, by avoiding the extended procurement at low rates, you would save about $4.9 billion. That is a new saving of about $600 million in this example, which works out to be about 5 percent of the total cost.

If you look at the discounted savings, you see that if you use a reasonably low discount rate, they are positive. But if you use a high discount rate, as DOD often does, you would not in fact be getting an economic return on the money that you invest.

Senator LEVIN. Well, except on the first and the fourth one.

Dr. THOMAS. I was speaking specifically of the F–15.

Mr. HALE. We usually use 2 percent. DOD and OMB guidance actually mandates 10 percent which is why we showed that alternative.

Senator LEVIN. Now would you be able to give us that with some reasonable degree of confidence on most of the weapons systems?

Dr. THOMAS. I think we could do that for the record, sir.

Senator LEVIN. Because that, it seems to me, is what we are going to come down to. We have got to look at each weapons system and decide where the stretchout makes the least economic sense to us, and where by investing more dollars and not stretching out and accelerating we will pick up the greater return.

In order to do that, we have got to have all of the systems in front of us, which is a heck of a lot of work, but it could really affect our own decision. For instance, there are some major differences here, obviously, between the helicopter and the F–14.

Mr. HALE. I do not want to destroy your confidence, and we will give it our best go. I do want to warn you that, as I said, we had a lot of difficulty teasing out rate effects from everything else that influences the cost of a weapons system—estimating errors, modifications, et cetera. So for some systems we have more confidence than for others, and we will try to convey that to you along with our answers. I will work with your staff and get you the best data that we can.

Of the 12 systems CBO analyzed, seven involve a significant increase in quantity over the administration's plan. Thus, computing savings from higher production rates would require making assumptions about how the administration would buy these additional units. CBO estimates of savings for the remaining five systems are shown on the attached table.

Savings in budget authority are computed in three ways: in current dollars (which includes inflation avoided by buying systems earlier), in constant fiscal year 1988 budget dollars, and in constant dollars discounted at 2 percent to reflect the time value of money. Each of these measures of savings may be relevant to the production rate issue, although the final measure (discounted real savings) is the way most economists would assess the financial benefit of higher rates. (It must also be remembered that increasing production rates generates other security benefits by putting new equipment into the hands of United States forces sooner. These benefits are ignored here.)

Buying the five systems at higher rates would save a total of $3.2 billion in current dollars over the life of the programs. Excluding inflation avoidance, a total of $1.7 billion in constant fiscal year 1988 budget dollars in savings would remain. Discounted at 2 percent, the total constant dollar savings for the five programs would still be $0.7 billion

ESTIMATES OF SAVINGS FROM HIGHER PRODUCTION RATES

System	Administration's Plan		Alternative Plan		Savings		
	Average Annual Rate	Total Cost a/	Average Annual Rate	Total Cost a/	Including Inflation a/	Excluding Inflation b/	Discounted at 2 Percent b/
Stinger Missile	5,272	1.6	6,326	1.6	0.1	c/	c/
F/A-18 Aircraft	73	16.6	116	15.5	1.0	0.5	0.2
SH-60F Helicopter	15	2.8	34	2.5	0.4	0.2	0.1
F-15E Aircraft	38	13.5	86	12.5	1.0	0.5	0.1
IIR Maverick Missile	5,074	5.0	8,457	4.2	0.8	0.5	0.3
Total		39.5		36.3	3.2 d/	1.7	0.7

SOURCE: Congressional Budget Office.

a. Costs in billions of current dollars.
b. Costs in billions of fiscal year 1988 budget dollars.
c. Less than $50 million.
d. Detail does not add to total because of rounding.

Senator LEVIN. The bottom line for me at least is that there are stretchouts and there are stretchouts. Sometimes it makes sense to stretch out something compared to what your other options are. Other systems, it might not. It all depends on the facts relating to that system, and what your contracts are, and who your buys are, and your gross buys, and your wholesale buys, and a whole lot of other things.

So we would have to know that, it would seem to me, to make an intelligent decision. Stretchouts, per se, I guess are bad, if it costs you money, but compared to other options you might want to do some stretching out, but not in others.

Mr. HALE. That is fair. There is clearly a trade-off. Then there is the additional difficult question of deciding what you are giving up in order to get that near-term money, one we cannot quantify. But we can at least try to give you a feel for the dollars, estimating how much you would save by producing a particular weapon at a faster rate.

Senator LEVIN. Weapon by weapon.

Mr. HALE. Weapon by weapon, as best we can.

Senator LEVIN. That would be helpful.

40 WEAPONS PROGRAMS

Can you summarize for us again the 40 systems that you looked at. How many of those systems are produced at what level from what they were predicted at the time that we approved them? Was that the 41, or was that the 27?

Mr. HALE. I fed you a lot of numbers quickly. Let me just go over them briefly for you and see if that answers it.

Out of 40 systems from 1983 to 1987, about 19 of them were produced at or above the minimum economic rate. So we are in here [indicating]. This is a hypothetical chart, but that is I hope a fairly reasonable point. About 21 of them were below the minimum eco-

nomic rate on average during 1983 to 1987. And a few of them, 9 during at least one year, were actually back in here [indicating].

Senator LEVIN. My question is a little different. My question is, have you gone back and looked at what the predicted rate was for those 40 at the time we approved initial production, and compared what we are really doing to what we based our decision to proceed on?

Mr. HALE. I think the answer to that is no, in the sense of going back and saying what was the maximum economic rate that was predicted in 1983.

Senator LEVIN. No. Like on the F-18 example, in 1980 when we approved the F-18—was that the example?

Mr. HALE. That was the example.

Senator LEVIN. We based that decision on an assumption that the rate was going to be 180 per year. Now we are at half of that. I am just wondering whether you have done that with those 40 systems? Because that is extremely illustrative and important to us when we look at new systems now.

Mr. HALE. Only to the extent we did look at those 40, we looked at a snapshot in time in 1983, assessing the plan for producing those 40 systems. But we have not looked, for each one, at the point when we made a decision, say, to produce it at high rates.

Senator LEVIN. If you could just take a sample, 40 may be a lot of work and we do not want to use all your time, not more than 95 percent of it for this subcommittee. [Laughter.]

Mr. HALE. We are trying to work on the Navy aircraft issues for you, too.

Senator LEVIN. We have got two subcommittees together. We can use 98 percent, I guess, without shame. But if you could take a look at 10 systems for us and tell us what was the rate that the decision to proceed was based on, we could then learn something which might affect our decision on new starts. Mr. Hamre is reminding me that that data is presented in the SAR.

Mr. HALE. Right. The data is certainly available.

The Congressional Budget Office (CBO) was unable to make a comparison of current production rates to those planned at the time production was approved, as requested by Senator Levin. The production estimate rate data presented in the Selected Acquisition Reports was either missing or the same as current rate estimates in too many cases. As a substitute, CBO compared rates planned at the time full scale development was approved (the "development estimate") with historic and currently planned production rates for 10 selected systems (see Table).

One of these 10 systems—the M1 tank—was produced at rates much higher than assumed in the development estimate: an average of 825 per year versus a development estimate rate of 360 per year. Three other systems were produced at rates within 20 percent of that planned in the development estimate. The remaining six systems' average rates over 1983–1987 were from 28 percent to 72 percent below their development estimate production rate.

These rate adjustments significantly delayed program completion. Even after taking into account increases in program quantity that were made subsequent to the full scale development decision, an average of five years was added to the six acquisition programs for which rates were slowed. Three systems—Stinger, Ground-Launched Cruise Missile, and the F-15—would have completed their acquisition program by 1987, had the development estimate rate schedule been followed.

DEVELOPMENT RATES FOR MAJOR WEAPONS SYSTEMS

System	Development Rate a/	Average Rate 1983-1987	Percent Change From Development Rate	1988 Rate	Percent Change From Development Rate
		1983-1987		Rate	
M1 Tank	360	825	129	600	67
Stinger Missile b/	4,800	2,332	-51	4,200	-13
AH-64 Helicopter	96	103	7	67 c/	-30
AV-8B Aircraft	54	34	-37	32	-41
Tomahawk Missile	198	184	-7	475	140
Phoenix Missile	307	222	-28	430	40
F-15 Aircraft	144	41	-72	42	-71
Ground-Launched Cruise Missile	120	99	-18	37 c/	-69
IIR Maverick Missile d/	6,000	1,944	-68	2,100	-65
KC-135R Aircraft Reengining	72	25 e/	-64	34	-53

SOURCE: Congressional Budget Office, based on data presented in the Selected Acquisition Reports.

a. Full production rate.
b. Army procurement only.
c. Last year of procurement; rate may be higher than shown due to program termination.
d. Air Force version only.
e. Excludes 1983, when no KC-135R modifications were authorized.

Senator LEVIN. Senator Bingaman.

Senator BINGAMAN. Thank you very much.

NEW STARTS

Let me just ask on this last table A-4, which is a list of new starts that we could save money by deferring.

Mr. HALE. Yes.

Senator BINGAMAN. You cited in your testimony that one of the disadvantages of improving production rates is that you have a lot of uncertainty, or I guess you have a lot of disruption of ongoing production activity, or you perhaps face the situation where you have to shut down a production line, wait a few years and start up another one.

Have you done any assessment of what would be the cost to the Government from putting off production in some of these areas for the next few years? What would we assume the contractors that would be involved in this would do during those two years?

Mr. HALE. I think I understand you, Senator. In other words, if we speed up the rates we may buy out that line and have a gap before a new system of that sort starts again, and what sorts of cost would be entailed there?

Senator BINGAMAN. Also, there are lines which are involved in these new starts which we would not be funding for a 2-year period. What is the cost?

Mr. HALE. Right, what would it do there? The answer is, we have not made an assessment, and I am not sure that is one we could quantify. Both of those, I think, particularly the latter one, are difficult questions. Let me take them separately if I might.

The problem of production gaps I suspect is limited, and I have no numbers to back this up, to a relatively few systems. If we bought out, for example, the F-15 line and closed that plant, we are certainly not going to lack engineers to start building the Advanced Tactical Fighter. There are plenty of other similar systems. I think there would be an adequate number of production people and aircraft engineers.

I am not saying there would not be a problem for the companies involved, but not for the country as a whole. It may be more of a problem for specific weapons like a tank or combat vehicle where we produce a lot fewer of them.

I think the harder question, and maybe the more serious one, is the inefficiencies introduced by delaying the R&D program for an SSN-21, or any of these systems here. There would, I would guess probably be inefficiencies. We have not tried to quantify them in this example. We have simply assumed that for those 2 years we hold constant in real terms the R&D money. So you have got the money to keep the team together.

Senator BINGAMAN. The R&D money for the items that are ready to start.

Mr. HALE. Right. They would normally, under administration plans, ramp up to initial production in those 2 years. We stop that. We say, hold the R&D money where it is so the R&D team can be held together.

Senator BINGAMAN. Even though the R&D has been done?

Mr. HALE. It is not done, usually, when we begin low-rate production. We are always continuing it. But our approach would disrupt the administration's plan because some of the money they would plan to spend would be, say to test production items, and we will not have those production items for them to test.

We acknowledge that in the testimony. I think it is another of the hard tradeoffs you face. There will be some disruptions.

Senator BINGAMAN. Do you have any thoughts as to whether there are any operations and maintenance costs involved in deferring this by operating the older systems longer? I mean is that something that has gone into your analysis, too? Or is that also impossible to quantify?

Mr. HALE. Well, it has not been assessed in our analysis. We focused here only on investment costs. I suspect that issue is a little

bit more susceptible to analysis, although again you would be amazed at how little we know about how operating costs change over time for systems.

I also suspect that changes in operating costs would be dwarfed by the other cost changes that we are talking about. Generally speaking, you would put off a couple of years worth of the costs of operating the new system that you are delaying, and in return you would presumably pay the costs of operating one of the earlier systems that you bought faster for a few more years.

I suspect the net effect of those two changes would be modest.

40 WEAPONS PROGRAMS

Senator BINGAMAN. Let me just ask a question which I asked Dr. Costello. In your analysis, you said the average of the 40 programs you looked at, was that production was at about 50 percent of its economic rate.

Mr. HALE. Yes, of the maximum economic rate.

Senator BINGAMAN. The maximum economic rate tells us that, at least as to those programs you looked at, there is tremendous excess capacity in the defense industry which we are seeing reflected in the cost to the Government of these weapons systems? If we were to follow your recommendation and get up production rates and defer new starts, would we see a very substantial shaking out in the defense industry?

Mr. HALE. Could I just issue our ritual disclaimer that we do not make "recommendations," and then I will try to be helpful in answering your question. [Laughter.]

Senator BINGAMAN. If we followed the options——

Mr. HALE. Right, one of the alternatives. I like that language.

Senator BINGAMAN. The Government gave us a series of options on energy security today.

Mr. HALE. Clearly there is excess capacity in defense plants, and clearly there are added costs associated with not producing at those higher rates. Again, if you buy the same number and you buy them at the higher rates, it is generally cheaper.

I think that you have to look weapon by weapon, but you would not find many cases where half of a plant sits empty. The F–15 is a good example. We have bought tooling to buy at a maximum economic rate of 144. We are producing in the forties. But McDonnell Douglas is building other aircraft in that plant, and the plant itself is certainly not two-thirds empty.

What constrains the economic rate in this particular case is the tooling. So, yes, there were some added costs of buying the tooling, and it would be cheaper to buy the same number of F–15s at a higher rate than it is at the rates we are buying. But staying at the rates we are at, or even going a little lower, I think would not necessarily force a major contraction in the industry.

I suspect this is frequently, although not always, true. You should not conclude that we would have to close half of the defense industrial plants, or that we have half of them sitting empty because we are producing at 50 percent of the maximum rate.

Senator BINGAMAN. So you are saying that the plant capacity to produce that other 50 percent is not now sitting idle.

Mr. HALE. In general, I think that is right. There may be cases where it is. I am not trying to be difficult, but I do not know all these cases. I gave you one example where I know it is not, because we had the opportunity to go visit there—that is, the case of McDonnell Douglas and the F-15.

There may be other cases where we really did build the lines to produce more and they are at least partially idle. But it is clearly not the case that 50 percent of these plants are empty.

Senator BINGAMAN. To the extent that that excess plant is not sitting idle and it is being used for something else, is that fact being reflected in the lower costs that we are charged for the weapons system that we are buying? I mean, even if we are buying at a low production rate, presumably it ought to be cheaper if they have got another use for the plant.

Mr. HALE. Right. Or to say it another way, it would be a lot worse if they just had to leave half the plant, or two-thirds in the case of the F-15, empty. I think that is the case.

The way to think about production rates and costs is that if you raise them, you walk down that cost curve I showed you earlier. Thus, to buy the same number at a faster rate is generally cheaper. I think that is the thing to keep in mind, or to think about. It is generally cheaper to move down that curve. It does not mean that we necessarily have large, empty plants.

Senator BINGAMAN. OK.

Mr. HALE. I am not sure I have answered your question.

Senator BINGAMAN. I think you have, but I do think that there is a real issue here. I mean, in the case of utilities for example. I used to spend some time on utility rate levels, and many of the major utilities in this country have excess or reserve capacity which the ratepayers are just sitting there paying for, on the theory that some day they are going to need that, and therefore they are paying for the capital that has gone into it.

You are saying that that is not the case in the defense industry?

Mr. HALE. Not always.

Senator BINGAMAN. Not always. You are saying that some of that excess capacity is being used for other purposes, and therefore the Government is not having to pay for the 50 percent which is not being used for the weapons.

F-15

Mr. HALE. Let me go back to the F-15 again. We bought the tooling to produce 144 a year. So we paid for that. That was a cost, and I do not think we ever got to that rate, or not for very long. So there was some wasted money in that sense. But that one happens to be a sunk cost.

But again, I just reiterate what I said before, it would be cheaper to buy F-15s at a faster rate. What McDonnell Douglas would probably do, if we were to buy F-15s at a faster rate, is go rent some more plant capacity and make full use of that tooling, and therefore it would be possible to bring down the unit costs.

So there are savings, but as you say it is not the case that the plants are sitting idle.

Senator BINGAMAN. Thank you very much.

Senator LEVIN. Thank you, Senator Bingaman.

In those cases where the 50 percent of capacity that Senator Bingaman was referring to is not being used for full production but is being used for other commercial purposes, why would we be charged full overhead on that?

Mr. HALE. If it is being used for other commercial purposes, I would hope we would not be charged full overhead.

Senator LEVIN. Why would that be an inefficient rate?

Mr. HALE. It is only inefficient in the sense that if I produced at a faster rate, I could get the same number at a lower unit cost.

Senator LEVIN. Even though the overhead would not go up per unit?

Mr. HALE. I assume again in the case of McDonnell Douglas they have got a fairly full plant with three different aircraft they are producing the AV-8B, the F-18, and the F-15. If you up the buys of F-15, they would bring some of the tooling out of storage. They would probably go acquire new plant capacity, and I would guess that they would not have to proportionally increase their overhead.

So you would get these advantages, some more spreading of existing overhead, and it would result in lower unit costs.

Senator LEVIN. Back again to that 50 percent figure that you utilized saying that generally the services have procured weapons over the last 5 years at 50 percent of the maximum ecomomic rate.

Mr. HALE. Right.

Senator LEVIN. Do all the military departments do about the same? Or do some of them do a better job than others of achieving production utilization?

Mr. HALE. Clearly not the same. The Army tends to be better. The Navy and Air Force are worse. How the Navy and Air Force rank depends on the particular measure, but the Army always tends to look better. I should say I answered your question based on the 40 systems that we looked at.

Senator LEVIN. In your testimony you indicated that 25 percent of the systems that you looked at, the 40 systems that you looked at, at one point or another during the past 5 years were manufactured at a rate below the minimum sustaining rate.

Mr. HALE. It was way up there on that chart.

Senator LEVIN. But in another part of your testimony you defined the minimum sustaining rate as the lowest production rate that can maintain an active production base. So my question is, how do we buy weapons below the rate that is the lowest production rate that can maintain an active production base?

Mr. HALE. I used DOD's definition there. I should have added the words "reasonably maintain an active production base." You can operate the plant at a lower rate. You are just on a very steep portion of the unit cost curves where operations are going to be quite costly.

Generally the minimum sustaining rate is associated with one shift of workers working five days a week, eight hours a day. You can operate the plant less, but you are paying a very high unit cost.

Senator LEVIN. OK. Now you have looked at the last 5 years' production rates. As you look at the budget request of the President

that he submitted, do you think that the problem you described is going to go away, get worse, or what?

Mr. HALE. I am afraid the direction of change in 1988 is clear. As I mentioned in my testimony, we have slowed 10 of the 20 largest weapons systems. Moreover, none of those 20 had rates that went up relative to plans a year ago. So I guess you would have to say it is certainly not getting any better. It is getting worse.

Senator LEVIN. You believe it is going to get worse under this budget request?

Mr. HALE. Well, if history is a guide, Mr. Chairman, and you reduce the dollars, then we will slow weapons rates. That is what we have done in the past.

Senator LEVIN. Would you say any effort to cut back further to meet the target that we have set for ourselves would be likely to lead to even greater inefficiencies?

Mr. HALE. Again, if history is a guide and we slow rates further, yes, that will lead to higher unit costs in general.

AIRCRAFT CARRIERS

Senator BINGAMAN. Let me just ask one other question, if I could. Again, on this table A–4 you have got two aircraft carriers. I guess those are the two that were requested this year?

Mr. HALE. Right. They are to be built in 1990 and 1993.

Senator BINGAMAN. There are three options before Congress I guess on aircraft carriers: Do what the President has asked for: refuse to do anything, give any money; or the option that you have got on table A–4, which is to defer the new starts for 2 years.

Mr. HALE. Right.

Senator BINGAMAN. How much does it cost us to defer that new start for 2 years, rather than just going ahead and saying no?

Mr. HALE. The Navy has given us some numbers, which we have not reviewed, that suggest that if you do not have what they call heel-to-toe production of aircraft carriers, it costs roughly $250 million a year in constant dollars. I am simply parroting back those numbers to you.

My understanding is that GAO may be auditing them for you, but at that rate we might be talking about added costs of $500 million.

Senator BINGAMAN. $500 million to follow your option?

Mr. HALE. That is right. That is what we did. We slipped them 2 years.

Senator BINGAMAN. Yes. To slow them costs more than to cancel them, right?

Mr. HALE. Yes—excuse me?

Senator BINGAMAN. To slow them costs us more than to cancel them, or refuse to appropriate for them.

Mr. HALE. Well—excuse me one moment. This is my Deputy, Jack Mayer, who points out rightly that $250 million in savings is relative to the Navy's plan of last year, which would have bought those ships in 1994 and 1996. They are now talking about buying them in 1990 and 1993, and they have estimated for you, and we have the numbers, the savings from buying them more quickly.

What I gave you was a reversal of that process. I would like, if I may, to think about that one and provide you a better answer for the record, because I am not sure that it is fully symmetric. But there would, I am sure, be some added costs in those cases of delaying it.

Senator BINGAMAN. Let me shift the question a little. This table A-4 has in it the costs on the assumption that we would buy those in 1994 and 1996?

Mr. HALE. We really only address the first one. We simply assume that, instead of buying the first carrier in 1990, you bought it in 1992. We simply slipped one of them. Is that right, Bill?

Dr. THOMAS. That is correct.

Mr. HALE. So we did not——

Dr. THOMAS. We did not slip the second carrier.

Mr. HALE. We did not touch the second one because we were really only looking at the next 5 years, 1988–1992.

Senator BINGAMAN. So if we go ahead and take the administration's request for two as it is now presented to us and just turn it down cold, we save a lot more money than you are reflecting in table A-4.

Mr. HALE. Yes; in that case you would not pay for either of the two ships at all.

Senator BINGAMAN. We would not pay for either at all, and you leave in money for keeping the option open to go forward with one.

Mr. HALE. Correct. Of course you would not get the carriers, either.

Senator LEVIN. You get them a little later.

Mr. HALE. You could buy them later, in which case then you would pay those costs later. That is always a confusing aspect of this business. There are rate effects. There are dollars associated with buying the same number, faster or slower. Those you might really view as efficiencies. You save money if you buy things faster; if you buy the same number faster, you save money.

Then there is what we have laid out for you in this option, which buys things faster and delays others. You are getting different things. You should not view those savings and costs as efficiencies, because you really are buying different things.

Senator BINGAMAN. Thank you, Mr. Chairman.

Senator LEVIN. I hate to see this described as a 2-year "deferral" on the aircraft carriers, when the plan on the aircraft carriers was 1993 and 1995?

Mr. HALE. 1994 and 1996, as of last year.

Senator LEVIN. 1994 and 1996.

Mr. HALE. It is a partial return to last year's plan.

Senator LEVIN. Exactly. Well, I guess you cannot help that. You just have one heading for the column.

Mr. HALE. Right.

NAVAL AIRCRAFT

Senator LEVIN. The question on that that I wanted to pursue has to do with the Naval aircraft. Do we lose more by stretching out the Naval aircraft?

Mr. HALE. We are getting close. I know you asked us this a long time ago, and we have been working hard on it. We have that data——

Senator LEVIN. You are stretching out my answer.

Mr. HALE. Excuse me? Yes. We have stretched out your answer. [Laughter.]

But I am coming back next Thursday, a week from Thursday, and I promise to have it in that testimony. Can I put it off until then?

Senator LEVIN. It depends on what you say. [Laughter.]

By all means. If all these stretchouts were only a week, we would be in good shape. That is the only question that I had.

Senator Bingaman.

Senator BINGAMAN. That is all I have.

Senator LEVIN. On behalf of both of our subcommittees—this is a joint effort on our part—we appreciate your testimony.

Our subcommittees are in need of this kind of information, and we will see you soon.

Mr. HALE. Thank you.

Dr. THOMAS: Thank you, sir.

[Questions for the hearing record with answers supplied, follow:]

QUESTIONS SUBMITTED BY SENATOR ALAN J. DIXON

PRIME CONTRACTOR OVERHEAD CHARGES

Senator DIXON. Dr. Costello, last year the Secretary of Defense testified that a third of your payments to major Defense contractors is going to cover contract overhead. The Secretary stated that it was a serious problem and he was going to try to do something about it.

What progress have we made in this regard?

Dr. COSTELLO. We conducted should cost reviews of plant-wide overhead at five contractor locations in both fiscal years 1985 and 1986. We planned an additional eight should cost reviews for fiscal year 1987. Compensation is the largest cost element in overhead. On April 7, 1986, we substantially strengthened the cost principle on compensation. We have also clarified many other cost principles such as, public relations and advertising, travel costs, entertainment and others, to make clear the costs in these areas that are not allowable. On March 12, 1985, the Secretary of Defense implemented a requirement that contractors must certify that overhead costs are allowable in accordance with our regulations.

Senator DIXON. What is the proportion of payments to prime contractors currently estimated to go for overhead?

Dr. COSTELLO. Our data indicates that in fiscal year 1985 overhead was running at 36 percent of total cost and in fiscal 1986 it fell to 35 percent. A one percent change applied to the total cost base equates to about $1 billion.

Senator DIXON. What can we do about it?

Dr. COSTELLO. We will continue to emphasize Should Cost Overhead reviews, the certification of indirect costs and will further clarify and strengthen cost principles.

GAO EVALUATION OF PRODUCTION RATES

Senator DIXON. Dr. Costello, last week the Comptroller General testified before this committee. His testimony was both insightful and troubling. Let me quote from his statement: "Little progress has been made in stabilizing weapons acquisition programs. The Department still needs to budget more realistically, limit the number of new programs, and eliminate marginal programs." First, Dr. Costello, do you agree with these findings? I note in looking at this year's budget request there are production stretchouts all over the map. It appears to me this problem is getting worse. What can we do to correct this problem? Is the GAO right in suggesting we limit new starts if we are going to solve this problem?

Dr. COSTELLO. The Department is always striving to improve its record of providing an efficient and effective national defense. From that perspective, I agree with the GAO that there is room for improvement in the area of program stability. As I

mentioned in my statement, the Department encounters severe difficulty in budgeting and planning realistically when there are significant fluctuations in the overall defense budget. The current fiscal year defense request, for example, is some $90B below our projections from just 2 years ago. We have had to lower our requests in light of major congressional reductions—some might call this budgeting realistically.

The issue of production rates is all too often analyzed in a strictly economic sense. Many other considerations also impinge on the acquisition process: industrial base concerns; valid mission needs and requirements; the nature and scope of the threat, to name a few. Nonetheless, the Department recognizes the importance of producing weapon systems at efficient rates. We have terminated ineffectual programs; witness DIVAD and AHIP. We scrutinize all new start requests not only through the budget process but also through the acquisition management process. We are in the process of instituting baselining as a means to enhance program stability. We continue to emphasize Multiyear Procurement, and, with the cooperation of Congress, we have achieved a great deal of success in this area. We will continue to strive for improvement and we urge the continued support of Congress as a partner in this effort.

Questions Submitted by Senator Richard C. Shelby

OPTICS

Senator Shelby. I have been informed that the United States may not have the capability to meet the optics requirements of the Department of Defense and defense-related industries. Can you elaborate on requirements which are optics related?

Dr. Costello. The Joint Logistics Commanders recently completed a study of the domestic precision optics industry which will be released in June 1987. They estimate the monthly mobilization requirements for optical elements to be:

Army:	
Aircraft	6,047
Howitzers	7,636
Missiles	60,566
Vehicles	366,383
Night Vision	280,240
	720,872
Navy:	
Ships	3,098
Aircraft	6,009
Missiles	186,460
	195,567
Air Force:	
Aircraft	6,141
Ammunition	12,357
Missiles	27,585
	46,083
Total	962,522

The average peacetime requirements for optical elements are 1.1 million per year of 1/12 of the mobilization requirements. The report further indicates that the domestic industry can meet the peacetime requirements. However, it can only support 60 percent of the mobilization.

Senator Shelby. The committee has heard the term "full spectrum" optics used, would it be possible to elaborate on what the Department of Defense feels is a "full spectrum optics" program and how it differs, if at all, from University optics programs?

Dr. Costello. A "full spectrum optics" program is one which encompasses a wide range of optical categories. This would include highly specialized, low volume optics used for a space telescope or research. They may be several yards in diameter. But, "full spectrum optics" would also include those with high volume and large com-

mercial applications, such as photographic lenses. There appears to be no difference between "full spectrum optics" and University optics programs.

Senator SHELBY. Could you tell the committee what budget line and out of which office the annual funding for optics research comes?

Dr. COSTELLO. Depending upon the phase of research, budget line funding could be one of the following: 6100 Basic Research with Universities and Labs; 6200 Exploratory Development and Applied Research; 6300 Advance Research for Practical Application, and 6400 Engineering and Development. The 1980/81 budget line was 62102E for the initial development of precision machining of optics. The current budget line is 63221 for rapid optical fabrication and advanced heat exchanges for cooled mirrors. Funding for optics research is disbursed within the services and to the Strategic Defense Initiative Office.

Senator SHELBY. How does the United States compare to the Soviet Union, Japan, and China in funding for optics research?

Dr. COSTELLO. The U.S.S.R. expenditure for military optics research in 1985 is estimated to have been 180 million U.S. dollars (in 1984 dollars). For Japan, the total government, military and civilian expenditure for optical electronics research during 1986 was $344 million. We do not have an estimate of China's funding for optics research. To estimate the DOD research expenditure for optics, we used the Defense Economic Impact Modeling System, which projects defense purchases and R&D expenditures of the products of a large number of industries, based upon the Defense budget. A summary of DOD expenditures for optics is listed below:

DOD

Fiscal year:	*Millions*
1985	$2,853
1986	3,174
1987	3,538
1988	3,767
1989	3,957
1990	4,171

Senator SHELBY. Do you believe that an increase in optics research, development and training is critical to the security of this Nation?

Dr. COSTELLO. Definitely yes; optics research, development and training plays a very important role in this Nation's security. While there has been a significant decline in our industry's ability to compete in the high volume, low cost commercial markets such as photographic lenses, many U.S. firms continue to participate in highly specialized, low-volume optic markets. In order to remain viable in this field, a strong R&D effort is critical. Of particular interest to these firms are the development of machines and equipment to increase manufacturing productivity, development of more sophisticated coating technologies, and research in aspheric lens production.

The challenge involving training is great. Specialized and lengthy training is required by this industry's workforce. Critical occupations in short supply include opticians (technicians), coating technicians, optical assemblers, quality controllers, grinders, and polishers.

Senator SHELBY. Last year, my colleagues on the Armed Services Committee included language in their legislation regarding the need for an additional Department of Defense supported full spectrum optics center. What steps are being taken to address the committee's direction?

Dr. COSTELLO. We are unaware of any legislation directing the Department of Defense to support a full spectrum optics center. The Joint Logistics Commanders have recently completed a reexamination of the domestic production base of the precision optics industry and did not identify such congressional guidance.

QUESTIONS SUBMITTED BY SENATOR STROM THURMOND

INEFFICIENT PRODUCTION RATES

Senator THURMOND. Dr. Costello, nearly half of the combat aircraft production lines in the DOD budget are requested at a production rate of one per month or less. What do you think about such low production rates?

Dr. COSTELLO. Low production rates are, of course, highly inefficient in a strictly economic sense. The Department recognizes this fact and attempts to budget for the most efficient rate feasible. Budgetary realities often preclude the achievement of

these planned production rates. In addition, many other considerations also impinge on the acquisition process: industrial base concerns; valid mission needs and requirements; the nature and scope of the threat, to name a few. While the Department would of course prefer to produce every weapon system at an efficient rate, this approach is many times simply not feasible due to budgetary constraints. The conventional retort to this argument is that the Department should then eliminate ineffectual programs. The response is the Department does eliminate programs: DIVAD, AHIP, and T-46 are three recent examples. This of course does not always eliminate the original mission need which these programs were intended to fulfill.

PACKARD COMMISSION CONCLUSIONS

Senator THURMOND. Dr. Costello, the Packard Commission concluded that "requirements for new weapon systems have been overstated. This has led to overstated specifications, which has led to higher cost equipment. Such so-called goldplating has become deeply embedded in our system today." Dr. Costello, we have a number of very large new start programs in the budget. We have the Advanced Tactical Fighter for the Air Force, the Advanced Tactical Aircraft for the Navy, the Light helicopter for the Army, the V-22 tiltrotor for the Marine Corps, the SSN-21 for the Navy, and the C-17 transport for the Air Force. These six programs alone will cost over $200B. All of these programs were started several years back during the height of the acquisition problems cited by the Packard Commission. Do you think any of these programs are goldplated?

Dr. COSTELLO. Through the acquisition management and the budget review processes, the Department analyzes and evaluates weapon systems at critical junctures. This process is quite comprehensive and detailed and is intended to ensure that we produce weapon systems as efficiently and effectively as possible and avoid any undue cost or effort. Goldplating is one of the undue costs that we attempt to eradicate through this intense review process. The department insists that all new starts in the budget be analyzed and justified. All of the programs you mention are involved in this process of evaluation in order to preclude goldplating.

INEFFICIENT PRODUCTION RATES

Senator THURMOND. Dr. Costello, I have noted a troubling pattern which has persisted for years in DOD. It is not a problem just with this administration, but has been going on for years. Invariably when the Services propose a new program they project very high production rates. Yet when we actually get into the program, we never buy at those rates, even though we have bought the plant and the tools to manufacture at those rates. I consider this a serious problem. Do you think it is a serious problem? Based on your experience in industry, what would be the impact of producing a General Motors car at say only 40-45 percent of the planned production rate and then trying to pass the added cost on the the consumer?

Dr. COSTELLO. The problem of inefficient production rates is indeed a serious problem, one that the Department has long recognized as such. That is why we attempt to structure production programs as efficiently as possible given the existing fiscal constraints. At General Motors (GM), we had to deal with the same sort of production rate problems and there were no absolute answers there either. In GM, if there was a significant downturn in the demand for cars, we reduced production rates. That had a major impact on the bottom line, in terms of unit cost and profitability. Of course, there is a crucial distinction between GM and the DOD, and it is an economic distinction. GM is in the business of providing private goods in order to hopefully realize some profit; these are goods consumed by government, industry, or individual consumers. DOD, on the other hand, provides a public good: national security. Many other considerations also impinge on the DOD acquisition process: industrial base concerns; valid mission needs and requirements; the nature and scope of the threat, to name a few. While we attempt to produce as efficiently as possible, these other considerations must be taken into account. In addition, the Department has little control over congressional reductions to our budget requests; these reductions sometimes exacerbate the problem.

Senator LEVIN. This hearing is now adjourned.

[Whereupon, at 3:56 p.m., the hearing was adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEARS 1988 AND 1989

THURSDAY, APRIL 2, 1987

U.S. SENATE, SUBCOMMITTEE ON CONVENTIONAL FORCES AND ALLIANCE DEFENSE, SUBCOMMITTEE ON DEFENSE INDUSTRY AND TECHNOLOGY, COMMITTEE ON ARMED SERVICES,

Washington, DC.

PROGRAM BASELINING AND MILESTONE AUTHORIZATION

The subcommittees met jointly in open session, pursuant to notice, at 2:05 p.m., in room SR-222, Russell Senate Office Building, the Senators Carl Levin and Jeff Bingaman (chairmen) presiding.

Present: Senators Levin, Bingaman, Dixon, and Gore.

Staff present: Romie L. Brownlee, deputy minority staff director; Johathan L. Etherton, John J. Hamre, and Kent Bankus, professional staff members; Russell C. Miller, research assistant; Kathleen L. McGuire, staff assistant.

Also present: Edward M. McGaffigan, Jr., assistant to Senator Bingaman; Charles C. Smith, assistant to Senator Dixon; Jim Sayer, assistant to Senator Wirth; Jeffrey Hyche, assistant to Senator Shelby; Karl H. Stegenga, assistant to Senator Quayle; Mark J. Albrecht, assistant to Senator Wilson; Alan Ptak, assistant to Senator Gramm; and Bill Wight, assistant to Senator Warner.

OPENING STATEMENT OF SENATOR CARL LEVIN, CHAIRMAN OF THE SUBCOMMITTEE ON CONVENTIONAL FORCES AND ALLIANCE DEFENSE

Senator LEVIN. Welcome, everyone.

This afternoon the Conventional Forces and Alliance Defense Subcommittee and the Defense Industry and Technology Subcommittee chaired by Senator Bingaman are holding a joint hearing on the Department's plans to establish baselines for major acquisition, and to submit Defense Enterprise Programs for milestone authorization.

Last year the Congress amended Title X to require the Department of Defense to establish program management baselines for major Defense Acquisition Programs. Congress also established a procedure for authorizing those programs on the basis of acquisition milestone, rather than on the basis of annual funding increments.

Both of these initiatives, program baselining and milestone authorization, were key recommendations of the Packard Commission. These two initiatives, if properly implemented, will provide greater stability to program managers. They also become the basis for a new pattern of congressional oversight. Rather than authorizing annual increments of countless programs, Congress would au-

thorize key milestones in the acquisition process and leave those programs alone unless they developed programmatical or budgetary problems.

By statute, the Department was required to designate not less than three major acquisition programs for milestone authorization in fiscal year 1988. Previously the Department had announced that it was designating 10 major acquisition programs as Defense Enterprise Programs, and intends to nominate 3 of those 10 for milestone authorization.

Mr. Richard Godwin, the Under Secretary of Defense for Acquisition, has the ultimate responsibility for implementing this new approach to program management and congressional oversight. We welcome him and look forward to his testimony on this critical reform.

After hearing from Mr. Godwin, we will receive testimony from Mr. Charles Bowsher, Comptroller General of the General Accounting Office. We have asked Mr. Bowsher to evaluate the candidate Defense Enterprise Programs, and to examine the feasibility of extending the milestone authorization concept to other major acquisition programs which are scheduled for major development milestones during the next two years.

Before we hear from Mr. Godwin, I will ask Senator Bingaman if he has an opening statement, and then if others join us there may be some additional opening statements.

Senator Bingaman.

OPENING STATEMENT OF SENATOR JEFF BINGAMAN, CHAIRMAN OF THE SUBCOMMITTEE ON DEFENSE INDUSTRY AND TECHNOLOGY

Senator BINGAMAN. Mr. Chairman, I really have a very short opening statement that I will ask to put in the record.

I welcome Mr. Godwin back. He is spending probably more time here than he has been allowed to spend in his own office this week. He did testify before the Defense Industry and Technology Subcommittee on Tuesday, which we appreciate very much, and I look forward to hearing the testimony from both witnesses.

[The prepared statement of Senator Bingaman follows:]

PREPARED OPENING STATEMENT OF SENATOR JEFF BINGAMAN

Thank you, Mr. Chairman. I'll not take much time so that we can devote more time to hearing from Mr. Godwin and Mr. Bowsher. The Defense Industry and Technology Subcommittee is particularly interested in this issue before us today, and considers it a natural extension of the hearing we held this past Tuesday. Mr. Godwin appeared before us at that hearing to give us a status report on implementation of the recent round of acquisition reforms.

Milestone authorization is one part of acquisition reform that goes a step beyond structural reorganization—it's a step into the real world of program managers and the very real problems they face in trying to manage programs. This effort—milestone authorization—is an attempt to help by giving them some stability. I think its something the Department of Defense and we in the Congress can do together.

There are, however, still some operating procedures we need to work out. For example, I don't think we have fully resolved how best to handle the phasing problem that exists in authorizing programs based on milestones when we are in a transition period leading to a two year budget. This can be solved, but it will take some work and cooperation between the Congress and the Department. I am hopeful Mr. Godwin can give us his views on this today.

One thing I think is critical. Milestone authorization is in reality a tentative step in the area of acquisition reform. As such, it is something of a test case. I think what's going to be tested as we work this issue is trust among all participants. That means the Public, the Congress, the Department of Defense, and the Defense Industry. If any of the participants violates that trust, then I suspect change in the acquisition environment will be a long time coming. The current level of rhetoric directed at the B–1Bs problems is precisely the kind of thing that detracts from our efforts.

Mr. Chairman, I too look forward to hearing from our witnesses today. This issue at first sounds somewhat routine—in reality it is far from that. We are truly moving forward. We look forward to working with your subcommittee on this important topic.

Thank you.

Senator LEVIN. Thank you, Senator Bingaman.

Senator Dixon, do you have an opening statement you wish to make?

Senator DIXON. Mr. Chairman, I will put my statement in the record.

[The prepared statement of Senator Dixon follows:]

PREPARED STATEMENT OF SENATOR ALAN J. DIXON

Mr. Chairman, at today's hearing Hon. Richard P. Godwin, Under Secretary of Defense for Acquisition and Hon. Charles A. Bowsher, Comptroller General of the United States will testify on the Department of Defense Authorization Act for fiscal years 1988 and 1989.

I understand that our two witnesses will report on the Department of Defense's efforts to implement baselining, defense enterprise programs and milestone authorizations for major acquisition programs.

Mr. Chairman, I look forward to hearing these reports.

Thank You, Mr. Chairman.

Senator LEVIN. Thank you, Senator Dixon.

Senator Bingaman and I get some of the drier subjects around here. Today's may sound like a dry subject, but it is a mighty important one that gets kind of into the guts of acquisition. We are all struggling to find ways of improving that system; some of the things we do sometimes have exactly the opposite effect, unintentionally, but we think these are good reforms to be put in place, and we are looking forward to hearing you and Mr. Godwin. You may proceed.

Senator BINGAMAN. Mr. Chairman, I was going to say, if he has any ideas on how we could use the milestone authorization for the highways, that would be useful. [Laughter.]

Senator LEVIN. Talking about highways, any one of these moments the buzzer will go off for the final vote on the Highway bill veto override—at least we think it will happen any minute—and when the time comes we are going to have to interrupt for as long as a half hour, because a number of us have responsibilities yet to fulfill immediately after the vote—explaining and justifying ourselves back home is what it amounts to.

Perhaps Senator Bingaman does not have that pleasant obligation. If he does not, he can just pick up where we leave off. Mr. Godwin, you may proceed.

STATEMENT OF HON. RICHARD P. GODWIN, UNDER SECRETARY OF DEFENSE FOR ACQUISITION

Mr. GODWIN. Thank you, Mr. Chairman, Senator Bingaman.

I would like to briefly summarize the statement I gave to you for the record. I am here today to discuss the concepts of Enterprise

Programs, milestone authorization, and baselining. These are three management and budgetary innovations that promise to greatly enhance the stability of our defense acquisition program.

The Congress amended Title X last year to increase the efficiency of the management structure of defense acquisition programs, and identify programs selected for this approach called the Defense Enterprise Programs which can waive DOD acquisition regulation or guidelines and would operate under a streamlined chain of command.

For fiscal year 1988 Congress required that the Department select at least three acquisition programs per service to participate in this innovative approach. Let me say that the Department supports the Enterprise concept. In fact, the streamlined management concept is one that we are working on now. At the same time we are implementing the Defense Enterprise Programs, we are also trying to implement the new acquisition system. They have much in common.

We are working toward a system in which the services are organized into a military and an acquisition organization where the acquisition executive manages his activities more along business lines, which I believe is the intent of the legislation.

We are increasing attention toward developing a cadre of experienced acquisition managers, a clear incentive career path in acquisition, and a means to train and retrain qualified people.

The new acquisition system will establish in each of the services an acquisition executive who will supervise the entire system of acquisition in the service. This is where I think our objectives coincide. There will be three levels of management between the project and the service acquisition executive. This means that we will have reduced the chain of command for all programs, including the Defense Enterprise Programs, to three levels. Each program or project will have a baseline plan which will be our principal project control tool. All programs and projects will become part of a management information system in which all the information will be entered by the project managers. This information will be untouched and used as the basic data in which we will develop all of our control and our monitoring activities.

We are also working on suggestions to the Congress for relief from statutes which encumber or have been found to be non-cost effective in our operations to date. In addition, we are working on internal DOD regulations and practices which unnecessarily hinder good business practice in our day-to-day operations. We are cooperating with the OMB in reviewing Federal procurement regulations aimed at the same objective.

A third area which we are giving attention to regards reviewing major projects and programs in what is normally referred to as the "milestone process." In this area we have reduced the number of committees and panels from 126 to 10. This we feel will greatly simplify the chain of reviews and briefings in the intended milestone process.

We have put in place a committee monitoring control structure to ensure timely, consistent, and orderly handling of all programs in the acquisition system. I am going into some detail here as to what the new acquisition system includes in part to demonstrate

that it is consistent and in harmony with the enterprise, milestone, and baselining legislation which was passed last year.

Employing the criteria of moderate program risk, firm requirements, and high priority, we have selected 10 programs to participate in this management streamlining effort in 1988. You have received copies of my prepared testimony, and you will notice that it does include 10, 6 of which are:

The Mobile Subscriber Equipment for the Army; the Army Tactical Missile System; Tube-Launched Optically Tracked Wire-Guided Missiles identified as TOW-II; for the Navy the Trident II Sea-Launched Ballistic Missile D-5; the SSN-21 Nuclear Attack Submarine; and the T-45 Trainer Aircraft.

Senator LEVIN. By the way, Mr. Godwin, your entire statement will be made part of the record. If you could summarize as much as possible, that would be helpful.

Mr. GODWIN. All right. I can summarize my remaining comments best by saying that the programs which you asked us to implement for both the streamlining of the milestone program and the identifying of the special programs are in place. We are working on them, and they are turning out to be a good precursor to the overall program.

Beyond that, I can best leave the subject by saying we are proceeding with the implementation of the Defense Enterprise Programs and we will keep the committee informed of its progress. We will also identify to you those regulations and practices which we find to be non-cost effective and not to the betterment of the business control of the enterprise.

Further, we will have before you the baseline plans which are required under the legislation for those enterprise systems which we have identified. Mr. Chairman, I will be happy to answer any questions you might ask.

[The prepared statement of Mr. Godwin follows:]

PREPARED STATEMENT OF RICHARD P. GODWIN, UNDER SECRETARY OF DEFENSE FOR ACQUISITION

Good afternoon Chairman Bingaman and Chairman Levin and members of the joint subcommittees. I am pleased to be here this afternoon to discuss the concept of milestone authorization, a budgetary innovation that promises to greatly enhance the stability of our defense acquisition programs. Under this concept, the Congress would authorize sufficient funds in a single amount necessary to carry an approved program through a particular acquisition phase. In this way, the Congress would join with the Department in supporting a program that had been approved for either full scale development or full rate production. My comments today will begin with a brief discussion of the milestone review process and the background of milestone authorization, covering the Defense Department's efforts to date in implementing not only this legislative initiative but also other departmental programs designed to improve program stability.

The Department of Defense manages the acquisition process through a system of milestone reviews. These milestones delineate discrete phases of the acquisition process. For example, Milestone O, as it is commonly called, represents the point at which a decision is made to actually start a new program. This decision takes into account such factors as mission need and affordability. Later Milestones, such as I, II, and III, respectively represent decisions concerning demonstration and validation of a system concept; full scale development and operational testing of the approved system; and full rate production of the system. Finally, Milestones IV and V focus on the system's readiness/support and operational phase.

This acquisition management system is comprehensive in that it involves a decision progression from system new start through operation and support to system retirement and eventually to system new start again. The process is designed to moni-

tor a program's development at critical junctures in order to ensure that the program remains in a stable posture.

Indeed, program stability is vital to the long-term success of defense acquisition. It contributes to the reduction of total program costs and facilitates long-range planning. We recognize program stability as a key factor in making the defense acquisition process more efficient and effective. Most importantly, it frees program managers to devote more time to actually managing their programs.

The Defense Department has been pursuing several initiatives, such as multiyear procurement [MYP] and baselining, designed to enhance program stability. The principal objective of our MYP effort is to achieve savings through economic lot buys. When the Congress approves a MYP contract for an acquisition program, it means that we can make a commitment to the contractor that the program will continue, thereby minimizing the contractor's financial risk.

The Packard Commission recognized our success with the MYP initiative and recommended its increased application, particularly for systems that have demonstrated stable funding and requirements. Since fiscal year 1982, we have requested MYP for 67 programs, 45 of which have been approved, yielding an estimated savings of over $7 billion. In our current fiscal year 1988-89 budget request, we are seeking MYP approval for an additional nine programs, estimated to total over $1 billion in savings.

Baselining also enhances stability by controlling key parameters including cost through the formal establishment of a set of program goals and objectives. These objectives describe the functional specifications, cost, schedule, and other factors critical to the success of the program. Recognizing the importance of baselining, the Department has established guidelines for the baselining of all major systems. We are currently working with the services on fully implementing this effort.

The baseline will be signed by the program manager [PM], the service acquisition executive [SAE], and the defense acquisition executive [DAE]. In this fashion, the baseline will truly reflect the commitment of the entire Department to a program. Programs in full-scale development and production will be baselined. The baseline document itself will be very brief (2-3 pages) and will summarize critical information that is reported in such documents as the SAR. Our baseline allows for some deviation from cost projections: 15 percent for development programs and 5 percent for production programs. This margin recognizes the need for management flexibility. In contrast, the Congress recently mandated that each Service Secretary baseline all major systems under their jurisdiction, but, in specifying the baseline information and format, allowed for no deviation whatsoever from baseline parameters. Frankly, this is an unrealistic requirement that will stifle flexibility. We believe the legislation can be improved and should be modified to reflect a reasonable deviation margin and also to be in concert with existing DOD baselining policy. We certainly cannot be partners in the program stability effort if we do not even have the same baseline definition. We would like to work with the Congress to ensure greater compatibility in our respective baselining policies.

The procedure for this baselining effort will essentially entail a "bottoms-up" management approach, with the PM actually preparing the baseline and submitting it to the SAE and DAE for approval and signature. All SAR programs are candidates for this baselining effort.

In addition to these ongoing efforts, the Department is also in the process of implementing a variety of congressional initiatives, including the Defense Enterprise Program and Milestone Authorization. The fiscal year 1987 Authorization Act, which created the Defense Enterprise Program, called for the Department to designate at least three (3) acquisition programs per service as enterprise programs. According to the law, these programs would not be subject to any acquisition regulation, policy, or guideline of the Department of Defense other than statutory requirements and the Federal Acquisition Regulation [FAR]. The service acquisition executive would have the discretion to decide which regulations would continue to apply. The Secretary of Defense is responsible for the overall management and conduct of the Defense Enterprise Program.

The law further required that no less than three (3) enterprise programs be requested for milestone authorization. Under this concept, the Congress could approve sufficient authorization to carry a program through a single acquisition phase, either full scale development or production (not to exceed 5 years).

After careful review of the service designations, we have selected 10 programs to participate in the Defense Enterprise Program. They include:

Army

Mobile Subscriber Equipment [MSE]; Army Tactical Missile System [ATACMS]; and Tube-Launched, Optically tracked, Wire-guided missile [TOW II].

Navy

Trident II D-5 Sea-Launched Ballistic Missile; SSN-21 *Seawolf* class nuclear attack submarine; and T-45 Navy undergraduate jet flight-training system.

Air Force

C-17A inter/intra-theater airlift aircraft; SRAM II short-range attack missile; medium launch vehicle [MLV]; and Titan IV space booster.

In designating these enterprise programs, we were guided by the following criteria: Moderate program risk; firm requirements; and high priority. It was the intention of the Department that only programs having these characteristics should be designated as enterprise programs.

Three of these enterprise programs will be requested for milestone authorization: MSE, Trident II, and MLV. In accordance with congressional direction, baselines on these milestone authorization candidates will be delivered when required—within 90 days of the official designation of the programs—to the Armed Services Committee of the House and Senate. We selected these milestone authorization programs primarily because of their high priority.

The Department supports the concept of milestone authorization as a budgetary technique to enhance program stability for our highest priority programs. We feel that only through the joint partnership of the Department and the Congress can real progress in the area of program stability be made. Milestone authorization represents just this sort of endeavor: The Secretary of Defense has carefully chosen high priority and relatively stable programs to participate in this initial effort and now requests that the Congress join with the Department in approving these programs for milestone authorization.

While the Department generally supports all efforts, legislative and otherwise, aimed at improving the weapons acquisition process, we must proceed cautiously with respect to implementing new and unproven initiatives. This is why the Department has selected just ten (10) programs as enterprise programs and requested milestone authorization for only three (3) programs. The Department has selected high-priority programs with stable funding profiles and relatively low technical risk. Indeed, this prudent approach was recommended by the Congress in the reports which accompanied the Authorization Act. The Armed Services Committees urged care and caution in designating the first enterprise programs. Any management lessons derived from the enterprise program will be applied to all Defense programs to the maximum extent practicable.

As a first step toward full implementation of the enterprise program, I intend to request that the SAEs clearly indicate which regulations and guidelines they intend to waive for certain programs. In conducting the milestone review process as the principal acquisition advisor to the Secretary of Defense, the Under Secretary for Acquisition (and other acquisition principals) require certain program documentation in order to make informed decisions and recommendations. Clearly, we want to avoid the untenable situation of having a SAE waive specific documentation integral to the acquisition decisionmaking process and consequently making it impossible for the Secretary's principal acquisition advisors to fulfill their responsibilities.

The relative advantages and disadvantages of the enterprise/milestone authorization concept must be carefully evaluated. By urging caution in the initial designation process, I believe Congress supports this approach.

Streamlined management including a shorter and more clear chain of command is an objective that I have for the DOD acquisition system as a whole. As we proceed with the implementation of the enterprise program, we will become more familiar with the process of eliminating unproductive directives and regulations while maintaining the management control necessary to ensure sound and stable programs that we can fund effectively.

That concludes my prepared remarks and I would be happy to answer any questions that you might have.

Senator LEVIN. Thank you, and we appreciate your summarizing it the way you have.

MILESTONE AUTHORIZATIONS

First, let me ask you this question. We looked at a list of the recommendations of the candidates for milestone authorizations and it strikes me as a timed list, frankly. The three that you have identified recommending are all in full-rate production, as I understand it. That means that you have not risked anything to go to a milestone authorization, and in fact if this list is approved, in a sense it would undercut the multiyear procurement. Because in those procurements, we insist on 10 percent real savings in multi-year contracts.

We have not required any such percentage savings under milestone authorizations. So I am wondering if you would comment on that. Why are all three candidates in full-rate production already?

Mr. GODWIN. The criteria we applied was program stability, priority, and a good indication as to what the program would require in terms of schedule and dollars.

I think you are probably right in that it is not a pioneering effort, or one that takes a great step forward, but we felt as an initial milestone recommendation these would be the best that we could do, or should do, at the present time.

When one considers that we are trying to implement an almost identical program across the board as part of the acquisition system, this seems to be a wise step at the present time.

Senator LEVIN. Do you think it would be fair to require that you get a 10-percent savings for each of these three programs if we give them milestone authorizations?

Mr. GODWIN. The best we can determine at the present time is that we expect to get this kind of savings in these programs.

Senator LEVIN. Would it be appropriate for us to require that? Is there any reason why we should not require it, the way we do for multiyear contracts?

Mr. GODWIN. I think you could. I am not too sure that anyone could predict with certainty that there will be a 10 or 15 percent savings. We have to get into the program, but these are programs which we have determined will result in savings. What the number happens to be, I am not sure. I would guess it would be something in excess of 10 percent.

Senator LEVIN. Well, let me ask the question in a slightly different way. If we are going to approve these particular programs, I am wondering if we should not amend the law to say that for any program, which you propose is in full-rate production, the same requirement of 10 percent savings will apply as applies under the multiyear procurement rules.

Mr. GODWIN. I can see the objective. I am not too sure that it would be helpful. I think the uncertainties associated with these programs will always be more of a hindrance than a help.

We have to rely on the expertise and the judgment of the people who are running the program to determine whether or not they are good candidates for the program. Accordingly, I would recommend we not do that, simply to encourage some innovation and risk taking on their part.

ENTERPRISE PROGRAMS

Senator LEVIN. OK, now you have designated 10 programs as Enterprise Programs. Why should not all of them be put under milestone authorizations?

Mr. GODWIN. Did you say why they should not be?

Senator LEVIN. Why should they not all be put under milestone authorizations?

Mr. GODWIN. Are you talking about the list we have?

Senator LEVIN. The 10, yes.

Mr. GODWIN. I think the only reason we would not recommend it at the present time is that we feel three are a good precursor. We would make progress just implementing those to see how it would work out. This does not mean that we will not be back in a few months recommending further additions to the milestone system but, as I pointed out, in implementing the acquisition system overall we are hoping to do just exactly what you suggest. We are hoping to streamline the system such that we do get these savings as part of the modification of the practices and procedures, or in the streamlined milestone process.

Senator LEVIN. DOD has submitted a biannual budget for 1988 and 1989. Are you proposing that we authorize any programs on a milestone basis for fiscal year 1989 beyond the three that you are required to propose for fiscal year 1988?

Mr. GODWIN. If the present implementation of the new acquisition system is not working out the way we hope it will, my estimate would be that we will be back with additional recommendations for milestone approval to this committee.

Senator LEVIN. But there is none in this 2-year budget?

Mr. GODWIN. Not in this 2-year budget.

Senator LEVIN. OK, I am going to stop there and call on Senator Bingaman so he will have a few minutes before we have to run to vote. I do not know whether we can wind up with Mr. Godwin or not, but go ahead.

DEFENSE ENTERPRISE PROGRAMS

Senator BINGAMAN. I would like to ask about whether the Defense Enterprise Programs would allow us to bypass the bureaucracy. Could you tell me what the chain of command is with regard to management of these Enterprise Programs?

Mr. GODWIN. The Enterprise Program, by definition, is an attempt to reduce the chain of command. As I mentioned, the objective of the new acquisition program is to do exactly the same thing such that there are only three levels between the project and the acquisition executive.

All of the enterprise programs will be implemented that way immediately.

Senator BINGAMAN. Now what are those three levels?

Mr. GODWIN. It will be the program or project manager; the program executive who will supervise maybe 8 to 10 projects; and then the acquisition executive in the service to whom the program executive will report. This will be the total chain of command which reduces it from the present 10 or 12 to 3.

Senator BINGAMAN. But your thought is that it would not be appropriate for us to go forward with using this technique on more programs at this time? We need a period to test it? Is that the idea?

Mr. GODWIN. No. As a matter of fact, I agree. We are in complete agreement. These are going into that system immediately. As far as the overall acquisition system is concerned, as I mentioned, in the services all of the acquisition programs, everything in the acquisition system, will be operated through three levels of supervision or management. Whether we put these ten in immediately, which we are going, or put them all in, as we are planning to do through this shortened management chain, is a question of timing more than intent.

BASELINING PROCEDURES

Senator BINGAMAN. Now these baselining procedures that you also talk about in your testimony, are those same procedures applied to the programs designated as Defense Enterprise Programs?

Mr. GODWIN. The baselining as a practice and a technique is something we are going to institute for all programs, but with particular emphasis on the Enterprise Programs initially. When I say "baselining," the Packard Commission and the legislation mentioned that the later use of baselining should be employed. That is what we are planning to do.

What this means is for every program we undertake we develop a plan. Now if it were in the research phase, the plan would be a very simple thing. It would be essentially an identification of the funds to be expended in the course of a year; the goal of the research development activity; and for our management information purposes, the cost to date and to go as far as the year is concerned.

As it progresses into validation and development or to the full-scale development, the baseline plan expands to include most of the information which is included in the law. We are planning to follow the Enterprise Program outline with all the programs in the acquisition system.

Senator BINGAMAN. Mr. Chairman, I know we need to go vote. I will have a few other questions that we can submit for the record. As far as I am concerned, and Mr. Godwin could go.

Mr. GODWIN. I would be glad to stay.

Senator LEVIN. Mr. Godwin, if it is satisfactory with Senator Bingaman that the balance of your answers be for the record, we can release you at this time. Thanks for coming by. There may be additional questions for the record from me or other Senators, as well, but we are happy to excuse you now.

Mr. GODWIN. Thank you.

Senator LEVIN. What we will do is recess for 30 minutes and hope to start at 5 minutes to 3. Mr. Bowsher, while we are here, let me thank you for all of the effort that went into the report which was released today as originally requested by Senators Nunn and Warner. We know that it was a monumental job that required around-the-clock work by your staff and yourself personally.

We very much appreciate you and your staff and the time you put in on this, and so many other reports, and hope you will extend

our appreciation to your staff. The reason I say that now, rather than half an hour from now, is on the chance that you might have to leave and leave the rest of the hearing to your deputy. You are free to do that. But I wanted you to hear personally just how appreciative we are while you are here.

Again, it is up to you and your deputy as to who handles the rest of the afternoon.

We will stand recessed for 30 minutes.

[Recess.]

Senator LEVIN. The subcommittees will come back to order. We want to welcome you, Mr. Bowsher. If you would summarize your statement for us, we will put the entire statement in the record.

Mr. BOWSHER. Fine, Mr. Chairman.

Senator LEVIN. Thank you for staying. We know you know why we had to leave.

STATEMENT OF HON. CHARLES A. BOWSHER, COMPTROLLER GENERAL OF THE U.S. GENERAL ACCOUNTING OFFICE; ACCOMPANIED BY FRANK C. CONAHAN

Mr. BOWSHER. Sure. We are pleased to be here today.

I am just going to give a highlight summary here of my statement. As you are very much aware, in the annual budget process Congress has normally reviewed major DOD systems as part of that process while the senior Defense officials at DOD have reviewed major systems in detail at key milestones in the acquisition process.

We believe that the Congress is correct in reviewing these programs at the key milestone rather than on just an annual budget basis.

We have some observations about the program. Although it is designed to bring greater stability to the acquisition process, we believe that the key to the success of this program is an appropriate level of oversight. While a major purpose of the legislation is to reduce congressional oversight and the levels of review within DOD, there should be sufficient oversight to ensure that programs are proceeding on track.

The legislation provides a framework for oversight, one, by requiring the program manager to prepare a comprehensive baseline of cost, schedule, and technical issues from which to measure program progress, and two, by requiring the Secretary of Defense to submit a deviation report to the Armed Services Committees whenever a program strays from the baseline.

If the baseline accurately portrays program expectations and if DOD provides timely reports on program deviations, that information will be useful for oversight purposes. I believe the GAO should continue to review the cost, schedule, performance, and other aspects of selected programs as part of the oversight process.

As you are aware, Mr. Chairman, DOD has named the Defense Enterprise systems. In the long term we are also prepared to assist in evaluating the overall implementation of the Enterprise Program process in determining whether the anticipated objectives are being realized.

One key question that needs to be assessed is whether the multiyear funding authorizations for Enterprise Programs will cause unacceptable production stretchouts or ineffectiveness in other programs. In other words, as more systems come into this program we have to be careful about effects on other DOD programs.

I think, Mr. Chairman, that concludes the highlights of my statement. We would be pleased to answer any questions.

[The prepared statement of Mr. Bowsher follows:]

PREPARED STATEMENT OF CHARLES A. BOWSHER, COMPTROLLER GENERAL OF THE UNITED STATES

OBSERVATIONS ON THE DEFENSE ENTERPRISE PROGRAM

Mr. Chairman, we appreciate this opportunity to share our views on the recent legislation establishing a milestone authorization process for defense acquisition programs. As part of the committee's efforts to move forward on this program, you requested us to review 20 major acquisition programs that might be candidates for milestone authorization. Our report on this effort is being released today. The report outlines the cost, schedule and performance status on each of the programs.

The Packard Commission, which completed its work last year, was very effective in calling attention to needed improvements in the defense acquisition process. It reaffirmed that such things as short, unambiguous lines of communication, an emphasis on innovation and productivity, and a stable funding and planning environment were all characteristics of successful programs. The Commission was candid and correct when it noted that all too often these characteristics were missing in the defense acquisition process.

Under the current process, the Congress evaluates and authorizes funding of programs on an annual basis while in the Department of Defense [DOD], senior decisionmakers review programs in detail at key milestones in the acquisition process. If senior DOD decisionmakers believe that a program can proceed, then the service establishes a baseline which is considered sufficient to support the program until the next acquisition milestone. The Packard Commission recommended extending this baseline and milestone review process to the Congress with the objective of reducing the funding uncertainties associated with the annual review process.

The Commission's recommendation provided the impetus for the recent amendment to Chapter 144 of title 10, United States Code which provided authority for the establishment of "enterprise programs." The purpose of this legislation is to (1) enhance program stability through multiyear authorizations and (2) provide a more efficient management stucture for defense acquisition programs. A service secretary may nominate as a defense enterprise program any program that is in or ready to go into full-scale engineering development or full rate production.

This year, each service secretary is required to nominate at least three programs to the Secretary of Defense. From these nominations, the Secretary of Defense is required to designate at least three as defense enterprise programs to be considered by the Congress for milestone authorization.

The new legislation is a major change in how funds are authorized. We support the objectives of the legislation and hope that it will lead to progress in stabilizing system acquisitions. Instability within the weapons acquisition process has long been recognized as the major stumbling block inhibiting greater efficiency. I am sure this committee recalls that a few years ago former Deputy Secretary of Defense Carlucci identified enhancing program stability as the cornerstone of the Defense Acquisition Improvement Program.

Unfortunately, recognizing the problem is not enough. It has proven to be an extremely difficult issue to solve. Despite the unprecedented peacetime budget growth in the early 1980s, our work indicates that DOD has had limited success in stabilizing the acquisition process. For example, in 1985 we asked defense program managers in both government and private industry whether they believed that the stability of their programs had improved during the 1980s. In their opinions, stability had not improved. While this is not encouraging, I do not believe that the problem is insurmountable. The enterprise program approach provides an opportunity to enhance and improve the acquisition process. With a continuing top level commitment within DOD and support from the Congress, we may be able to make some progress in stabilizing defense acquisitions.

This committee has recognized that the transition to the enterprise process will not be easy. The enterprise program concept is designed to introduce improved management practices on a selective basis rather than radically overturning the process in the short term. The expectation is that if this concept proves to be an effective way of managing a few acquisition programs, it could be expanded to more programs.

In this early stage, a key to successfully implementing the enterprise process is to proceed deliberately and carefully select a few stable programs. While most programs have some degree of risk, programs selected should be stable in terms of not having significant cost, schedule or performance problems.

Our review of the 20 major acquisition programs that are in or ready to go into full scale engineering development or full rate production underscores the need for care in selecting programs. As you might expect, a majority of the programs we reviewed are experiencing cost growth, schedule slippage or technical difficulties.

Another key to success will be achieving an appropriate level of oversight. While a major purpose of the legislation is to reduce congressional oversight and the levels of review within DOD, there should be sufficient oversight to ensure that programs are proceeding on track. The legislation provides the framework for oversight (1) by requiring the program manager to prepare a comprehensive baseline of cost, schedule, and technical issues from which to measure program progress and (2) by requiring the Secretary of Defense to submit a deviation report to the Armed Services Committees whenever a program strays from the baseline. If the baselines accurately portray program expectations and if DOD provides timely reports on program deviations, that information will be useful for oversight purposes. I believe GAO should continue to review cost, schedule, performance and other aspects of the selected programs as part of the oversight process.

Earlier this week DOD announced that it would request milestone authorization for three programs—the Army's Mobile Subscriber Equipment; Navy's Trident II D-5 Sea Launched Ballistic Missile; and Air Force's Medium Launch Vehicle. DOD stated that these programs were selected primarily because of their high priority. One of these programs, the Trident II, was among the 20 systems we reviewed, and it appeared to us to be a viable candidate for milestone authorization for the following reasons:

—The program has a sound management structure, characterized by program manager stability.

—Lessons learned over the past 30 years on the Strategic Missile Submarines, Polaris and Poseidon, have been effectively applied to the Trident II; and

—The program has been reasonably fully funded and the Navy has been quite successful in meeting its milestone objectives.

We have previously audited the Mobile Subscriber Equipment Program but have not reviewed the Medium Launch Vehicle Program. We are prepared to assist the committee in its assessment of these three candidate programs.

In the long term, we also would be prepared to assist in evaluating the overall implementation of the enterprise program process and determining whether the anticipated objectives are being realized. One key question that needs to be assessed is whether the multiyear funding authorizations for enterprise programs will cause unacceptable production stretchouts or inefficiencies in other programs.

Mr. Chairman, you specifically asked for our views on how milestone authorizations might be integrated in a biennial budget. A key issue here is that an acquisition program might be scheduled for a milestone late in the biennial period and only limited information would be available at the time milestone authority is being considered. This would increase the uncertainty about the program. For example, a program might be scheduled to reach its full rate production milestone well into the second year of the biennial budget. Before reaching a decision on whether to authorize full rate production, decisionmakers should have operational test results. However, in my example it would be very unusual for such results to be available at the beginning of the biennial period. In this case, it would seem prudent for the Congress to (1) withhold approval of the system as an enterprise program until operational test results are available or (2) provide only tentative approval pending a certification by DOD that the operational tests show that the system meets performance expectations.

Mr. Chairman, this concludes my prepared statement. I would be pleased to respond to any questions you or members of the committee may have.

Senator LEVIN. Thank you very much, Mr. Bowsher.

GAO ASSESSMENT ON BASELINING

Can you give us a GAO assessment on how the Department is implementing baselining?

Mr. BOWSHER. Well, we think that the baseline is the key to the whole thing. When we see some of the programs like the B–1 bomber where Congress was not given timely and sufficient information that worries us. So we think that the baseline feature of this program is essential, and that it needs to be monitored very carefully.

Senator LEVIN. Have you been able to make an assessment or an evaluation of the baselines which have been proposed for the Defense Enterprise Programs?

Mr. BOWSHER. We have reviewed the Trident missile. But on the Army's Mobile Subscriber equipment, and the Medium Launch Vehicle, we have not done enough audit work to make a determination.

Senator LEVIN. So that on only one of the three systems which have been recommended for acquisition milestone authorization, you have been able to look at the baseline to determine its adequacy?

Mr. BOWSHER. That is right. We will do additional work on the other two systems.

Senator LEVIN. Would you be able to get us that work in the near future so we can take into account your evaluation?

Mr. BOWSHER. Yes.

[The information follows:]

MILESTONE AUTHORIZATION

The GAO follow-up report on the Army's Mobile Subscriber Equipment and the Air Force's Medium Launch Vehicle were provided to the committee on April 21, 1987.

GAO

United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

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April 21, 1987

The Honorable Carl M. Levin
Chairman, Subcommittee on Conventional
Forces and Alliance Defense
Committee on Armed Services
United States Senate

The Honorable Jeff Bingaman
Chairman, Subcommittee on Defense
Industry and Technology
Committee on Armed Services
United States Senate

Recently the Secretary of Defense nominated three major acquisition programs for milestone authorization under the "Enterprise Program". One of the three programs--Navy's Trident II (D-5) System--was included in our April 2, 1987, report to the Chairman, Senate Armed Services Committee (Defense Acquisition Programs: Status of Selected Systems, NSIAD-87-128).

On April 2, 1987, during hearings before your Subcommittees, we were asked to provide information on the other two programs that the Department of Defense has nominated for milestone authorization--the Army's Mobile Subscriber Equipment and the Air Force's Medium Launch Vehicle. The costs, schedule, and performance information on the programs is included in enclosures 1 and 2.

To develop this information, we interviewed Defense and service program officials and examined program and budget documents and selected acquisition reports for both programs. We discussed the results of our work with program officials, and their comments have been incorporated where appropriate.

Frank C. Conahan
Assistant Comptroller General

Enclosures - 2

ENCLOSURE 1 ENCLOSURE 1

MOBILE SUBSCRIBER EQUIPMENT

BACKGROUND

The Mobile Subscriber Equipment (MSE) program is intended to improve Army battlefield communications by providing telephone service between command posts and other users in the corps and division areas of operation. The MSE system will use equipment and software already developed by American and European companies. About $1.3 billion of the estimated $4.7 billion total acquisition cost of the program has been appropriated to date. The Army is seeking $1.02 billion in fiscal year 1988 to continue MSE production.

While the potential benefits of the MSE acquisition are large, its strategy also presents risks. The contractor must integrate numerous MSE components to configure corps and division system sets, and the Army must test and evaluate the performance of the first production set in an operational environment next year. Indications are that the prime contractor is close to schedule with its plan to deliver the first set of equipment for testing. Also, senior Army and DOD officials have given special management attention to this program to further assure its success.

DESCRIPTION

In December 1985 the Army awarded a contract to GTE Corporation for production of MSE. The system will consist of switches, radios, automated control centers, and power equipment installed in vehicles. These MSE-equipped vehicles are intended to provide an automatic, secure telephone service for mobile and stationary users on the battlefield. MSE is intended to be the primary voice and data communications capability for the corps and division operational areas and is one of three major systems[1] in the Army's tactical communications architecture.

By buying a system requiring limited additional development and keeping production at a steady pace, Army program officials stated that they expect to save considerable time and money over traditional acquisition programs, which involve lengthy research,

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[1]The other two are the Single Channel Ground and Airborne Radio System (SINCGARS) and Position Location Reporting System/Joint Tactical Information Distribution System (PLRS/JTIDS).

development, and test phases. Most of the equipment and software has already been developed by companies in the United States and Europe. The prime contractor is responsible for integrating the various MSE components into corps and division communications system sets. The contractor is also responsible for delivering and fielding the system in corps and division sets and for training military personnel to operate and manage the systems throughout the entire Army.

The MSE production contract is firm fixed price and includes a basic year contract with six additional option years. The basic year and first two options have been awarded; the Army expects to exercise the third option near the end of fiscal year 1988. In addition, the Army has a requirements contract with GTE to provide training, spares, and support services for a 15 year period after the system is completely fielded.

COST

The estimated procurement cost for MSE is about $4.7 billion to equip 5 Army corps, 28 divisions, and other organizational units. The current estimate is higher than the original $4.3 billion estimate because of requirements for the additional Army units created during the last several years.

No research and development funds have been requested for MSE as it is considered a nondevelopmental acquisition.

The Army's budget requests for MSE procurement funds for fiscal years 1985 to 1988 and projected for fiscal years 1989 to 1991 are shown in table 1.

Table 1: Budget Requests for MSE Procurement Funds Fiscal Years 1985 to 1991

Fiscal year	Amount (millions)
1985	$ 63.3[a]
1986	335.3[a]
1987	903.7[a]
1988	1,019.9[b]
1989	995.7[b]
1990	976.2[c]
1991	360.0[c]
Total	$4,654.1

[a]Amount appropriated.
[b]Amount requested.
[c]Amount projected.

In addition, the Army is asking for $27.9 million in Operation and Maintenance funds for fiscal year 1988.

SCHEDULE

The MSE program is in milestone IIIB (full-rate production). To field a new communications system as soon as practical, the Army has set an aggressive production and fielding schedule. The schedule shows that MSE will be completely fielded by 1994. Key schedule dates are shown in table 2.

Table 2: Key Dates in MSE Acquisition Schedule

Event	Date
Basic contract award	Dec. 1985
Option 1 award	Dec. 1985
Option 2 award	Feb. 1987
Begin fielding	Feb. 1988
Follow-on operational test and evaluation	May-Sept. 1988
Option 3 award	Sept. 1988
Option 4 award	Mar. 1989
Option 5 award	Mar. 1990
Option 6 award	Mar. 1991
Complete fielding	Jan. 1994

The Army is required to exercise the third production option within 120 days after completion of the field training exercise, which precedes the follow-on operational test and evaluation.

In addition to the follow-on operational test and evaluation, the Army has set up a continuous evaluation program to test and monitor system components as they are delivered by the contractor. Army officials believe this testing, together with the manufacturer warranties, is important to the success of the innovative acquisition strategy for MSE.

PERFORMANCE

Although the nondevelopmental approach used for MSE means that the Army is buying equipment that has already been developed and tested, the contractor must still integrate the many components into corp and division system sets and turn them over to the Army for user tests and evaluation in realistic environments. While most MSE production is on schedule, a number of issues have been recently raised by organizations and individuals which evaluate the MSE program regularly, as indicated in the following examples.

-- The Office of the Director, Test and Evaluation, Department of Defense, expressed concern about the risk in making the many software changes required to make the various components work as an integrated system. Test and evaluation officials indicated that the need to prove that MSE offers the capabilities needed by the combat forces is more important than the type of acquisition being used by the Army for MSE.

-- A consultant's evaluation of the MSE program in December 1986, conducted for the Army Materiel Command, included a recommendation that the Army quickly resolve problems in the areas of communications security, interoperability, test plans, and logistics support if the program is to be successful.

-- Officials of the Army's Operational Test and Evaluation Agency stated in March 1987 that, although the proposed MSE follow-on test and evaluation will be performed during a short period of time and will not include an entire complement of corps equipment, it should be adequate for determining whether option 3 should be awarded.

Both Army program officials and the contractor have dealt and are continuing to deal with these issues to help assure a successful program. For example, senior Army officials are briefed regularly on outstanding issues and have committed additional resources to resolve them. Contractor officials have stated their company is committed to the program and emphasize that MSE is covered by service and system warranties. When asked about concerns over the amount of software changes, one contractor representative stated that GTE would not have agreed to such a tight schedule if the changes were as extensive as some DOD officials have stated.

OTHER ISSUES

System alternatives

System alternatives were considered during proposal evaluation and source selection. The MSE alternative of GTE Corporation was selected in December 1985.

Adequacy of funds

Funds allocated to the MSE program through fiscal year 1987 have been sufficient to keep it on schedule and within the contract terms.

RELEVANT GAO REPORTS

Evaluation of Army's Mobile Subscriber Equipment Program, NSIAD-85-117, July 16, 1985.

Status of the Army Command and Control System Program, NSIAD-86-184FS, August 26, 1986.

ENCLOSURE 2

ENCLOSURE 2

DELTA II
MEDIUM LAUNCH VEHICLE

BACKGROUND

The Air Force needed to acquire medium launch vehicles (MLV) because of the lack of launch capability created by the loss of the space shuttle Challenger. The Air Force awarded a contract to acquire and launch up to 20 Delta II rockets to meet this requirement, which could amount to $754.3 million in then-year dollars. The first Delta II launch is scheduled for October 1988 and performance requirements are expected to be met.

SYSTEM DESCRIPTION

The Air Force is acquiring MLVs to launch the NAVSTAR Global Positioning System (GPS) satellites. The Air Force selected the McDonnell Douglas Delta II rocket to launch the GPS satellites and awarded a contract in January 1987. Currently, all launches are planned for Cape Canaveral Air Force Station, Florida.

The Delta II evolved from a series of Delta space launch vehicles that have been used by DOD and NASA since 1960. The Delta II consists of two liquid fuel stages, a solid fuel PAM-D upper stage, and nine solid rocket boosters attached to the first stage. Two Delta II configurations will be used, each with different lift capability. The launch vehicles are designated the Delta II 6925 and the Delta II 7925. An enhanced version of the Delta II 7925 is under study.

COST

Contract

In August 1986, the Air Force awarded a total of four phase I contracts, one each to the McDonnell Douglas Astronautics Company, Martin Marietta Corporation, Hughes Aircraft Company, and General Dynamics Corporation to develop preliminary MLV designs. Each contract was for $5 million, for a total of $20 million. Phase I was completed in February 1987.

In January 1987, McDonnell Douglas was awarded the phase II contract for seven Delta II vehicles and Cape Canaveral launch pad modifications at a price of $308.8 million. (All phase II contract costs are in then-year dollars.) Program officials estimate the cost of the pad modifications at $1.3 million. The contract

includes two production options: (1) seven additional Delta IIs at a price of $134.8 million and (2) six additional Delta IIs at a price of $136.6 million. The total for the 20 vehicles would be $580.2 million if both production options are exercised.

The contract also includes launch operations to be provided by McDonnell Douglas. The first seven launches will cost $26.6 million, and the optional 13 launches would cost $45 million, for a total of $71.6 million for 20 launches if both production options are exercised.

The contract includes special studies that may be done at the Air Force's option. The costs of these studies, if requested by the Air Force, could amount to $17.5 million.

The Air Force has obligated $1 million of the $7.7 million for special studies related to the first seven vehicles. About $160,000 of the $1 million will be used to study the (1) feasibility of modifying Vandenberg Air Force Base Space Launch Complex 2 West for Delta II launches, and (2) utility of existing Cape Canaveral Air Force Station launch facilities and aerospace ground equipment for Delta II launches at Cape Canaveral.

An incentive is also provided for in the contract. A mission success incentive would provide $3 million for each successful launch, which could amount to $60 million if all 20 launches are successful. According to a program official, the Air Force intends to add an award fee to the contract in May 1987 which would provide an additional $1 million profit based on the Air Force's evaluation of the contractor's performance. This could amount to $5 million. Therefore, incentives and fees could total $65 million. The contract also includes disincentives for launch failures that could cost McDonnell Douglas all profit, award fees, and interest on any previously earned incentives.

If all 20 launches are successful and all special studies are conducted the total cost of the phase II contract would be $734.3 million.

Total program

After the scheduled 20 vehicle buy, there are also plans for production of four Delta II vehicles per year, beginning in fiscal year 1990. This indicates an ongoing MLV program for GPS support. Program funding requirements for fiscal years 1986 through 1992 would total $1,343.7 million in then-year dollars. These funds are required to procure 32 Delta II vehicles and to launch 24 Delta IIs. However, operations and maintenance funding requirements for the other eight Delta IIs will require additional funds and are not

included in the $1,343.7 million. The Delta II funding requirements for fiscal years 1986 through 1992 are shown table 1.

Table 1: Delta II Funding Requirements
Fiscal Years 1986-1992

Appropriation	(millions)
Research and development, test and evaluation (3600)	$ 193.8
Missile procurement (3020)	977.9
Operations and maintenance (3400)	172.0
Total	$1343.7

Program officials believe the program is adequately funded for fiscal year 1987, but that total funding is marginal due to an estimated fiscal year 1991 production shortfall of $51.1 million. This amount is needed for contractually required performance incentives and for Delta II technical support. The program office intends to fund the shortfall from the total obligation authority of the space boosters program (program element 35119F).

The Air Force was authorized $32.4 million in fiscal year 1986 and $268.8 million in fiscal year 1987 for the program. As of April 1987, the Air Force has obligated $32.2 million and $227.4 million of the fiscal years 1986 and 1987 funding, respectively.

Program officials said program costs are tracked using the DOD Cost/Schedule Control System Criteria, which is a list of standards that all effective management control systems should be able to meet. According to the officials, one of the requirements is a monthly cost performance report from the contractor to the program office, the first of which is due by the end of April 1987. Program officials said they will begin formally reviewing the contractor's cost reporting and measurement system for this contract in July/August 1987. The officials stated they do not anticipate any cost difficulties.

Program officials said they will review NASA's investigation report on the recent Atlas failure to determine if any modifications will have to be made to the Delta II. If modifications must be made, either reprogramming or supplemental funding would be required. The officials stated that the program has a management reserve; however, it would not be sufficient to fund such modifications because it is only about 4 percent of the procurement appropriation.

SCHEDULE

According to a contractor's report dated April 10, 1987, the Delta II program is generally on schedule to meet all required milestones. These milestones include deliveries of the first, second, and upper stages and the payload fairing; a Delta II 7925 or the enhanced design for the last 11 Delta IIs to be produced; and launch pad modifications. Baseline schedules for major assemblies were to be finalized by late April 1987.

The Delta II 6925 configuration will be adapted from the existing 3920 model and used to launch the initial nine GPS satellites. A preliminary design review was held in December 1986. The program office is in the process of evaluating critical assemblies from the existing Delta rocket design to determine whether they can be used "as is" in the Delta II configurations or need further testing. A critical design review to determine whether the engineering design is ready for production is scheduled for August 1987, and the first Delta II 6925 is scheduled for a final configuration assessment on the launch pad at the end of April 1988.

Overall program milestones have been set and are being met, according to program officials. Baseline schedules for the Delta II 6925 major assemblies of the first and second stages, the fairing, the upper stage, and for six major subcontractors were to be finalized by late April 1987. As of April 10, 1987, the contractor reported that no problems were identified in the first, second, or upper stages, but there was a potential slippage of about 8 weeks in the payload fairing delivery schedule. Program officials told us that the contractor has been notified of the potential slippage and has said he will deliver to meet dates in the schedule.

The first Delta II launch will be the 6925 configuration scheduled for October 1988, with six more launches scheduled during fiscal year 1989. Program officials said that the contract options to acquire 13 additional Delta IIs can be exercised by January 15, 1988, for option 1 and January 15, 1989, for option 2, assuming that Congress approves the funding. A requirement exists for the tenth and subsequent Delta IIs to lift GPS satellites with additional equipment. Program officials said they expect to decide in May 1987 whether to buy a current Delta II 7925 design or an enhanced version of it in order to launch the heavier GPS satellites. The tenth Delta II is scheduled for launch in early May 1990. Modifications to the launch pad at Cape Canaveral are necessary to handle the Delta II launches. Plans include work on the mobile service tower to elevate the roof and add a new level,

relocate a crane assembly, and add levels for access to the Delta II's fairing, second stage, and center body. This work is scheduled to start in September 1987 and to be completed in May 1988, 5 months before the first scheduled launch.

PERFORMANCE

The performance requirements are different for the two vehicle configurations.

The primary lift requirement for the Delta II 6925 is to lift 1,850 pounds into a 10,898 nautical mile final orbit. As of April 1987 the program office estimated that it would meet that requirement, with excess lift capability of about 120 pounds. The primary lift requirement for the Delta II 7925 is to lift 2,100 pounds into a 10,898 nautical mile final orbit. As of April 1987 the program office estimated that it would meet that requirement, with excess lift capability of about 179 pounds. The estimates were derived using contractor model simulations, which are done on a continual basis.

The program office is studying the feasibility of developing an enhanced version of the Delta II 7925, which it estimates will lift 2,604 pounds, 325 pounds more than the 7925 version. The additional lift capability is not needed for the existing GPS satellites, but program officials said it will provide additional capability for heavier GPS satellites and other potential users. The Air Force will decide some time in May 1987 whether to buy the enhanced design.

Program officials said the Delta II program is not following the traditional DOD research and development process because the program primarily involves modifying proven hardware and that the test and evaluation is being done by the contractor under a test and evaluation master plan.

(395070)

10-PERCENT SAVINGS

Senator LEVIN. I asked Mr. Godwin this question, and I was wondering what your reaction was to his answer, which is the following:

Each of the three programs the DOD has recommended for milestone authorization are in full-rate production so that essentially they have not risked anything in proceeding to milestone authorizations. As a matter of fact, I pointed out that it might even weaken our multiyear procurement program because there we insist on a 10-percent savings where we authorize multiyear procurement, and there is no such requirement for percentage savings under milestone authorization.

Do you believe we ought to require or insist on 10 percent savings, or some other percentage of savings, where the milestone authorization is being requested for a program which is in full-rate production?

Mr. BOWSHER. I think the same multiyear funding authorization principles would apply. I think the committee should ask DOD about the appropriate percentage of savings.

Senator LEVIN. Would you be able to give us a recommendation on that?

Mr. BOWSHER. I think after we have looked at the other two baselines we probably could give you our thoughts on it.

I think it would help, too, Mr. Chairman, if you pursued it with DOD by asking for their opinion, and we could review the data that they would work up.

Senator LEVIN. Well, I think we got their opinion today. We can ask Mr. Godwin for any additional information you may want to submit, but I am not sure we will be able to get that in time for us to act.

Mr. BOWSHER. OK, we will try to——

Senator LEVIN. Do the best you can.

Mr. BOWSHER. Yes.

[The information follows:]

MILESTONE AUTHORIZATION

The legislation which established the milestone authorization process does not require a percentage of savings for the procurement program. However, since Defense Enterprise Program authorization will result in a multi-year procurement, we would expect a comparable savings rate. It is too early in the Defense Enterprise Program process to determine what an appropriate savings rate should be. Congress could make an initial determination for enterprise programs based on past multi-year procurement rates, and a final determination after a few year's experience with enterprise programs.

CONCERNS ABOUT MAJOR ACQUISITION MILESTONES

Senator LEVIN. Do you have any concerns about authorizing programs that have major acquisition milestones in the second year of a biannual budget?

Mr. BOWSHER. Yes. That is a problem because you have to be concerned with testing. In other words, if you get a nomination early in the two-year period and adequate testing has not been done, I think there is a risk of moving forward, and especially as it

is further and further into the 2-year period. So I think that adequate testing of a system should be considered.

Senator LEVIN. Have you evaluated the 10 Defense Enterprise Programs which have been nominated by the Defense Department?

Mr. BOWSHER. We have only evaluated some of them.

Senator LEVIN. Could you just tell me the number out of the 10?

Mr. BOWSHER. We have really evaluated three.

Senator LEVIN. Were those the milestone programs?

Mr. BOWSHER. One of the three was a milestone program.

Senator LEVIN. The other two, then, that are not milestone nominees, can you give us a recommendation as to whether we ought to authorize those for milestone authorizations?

Mr. BOWSHER. Yes, we will try to do that for you.

Senator LEVIN. You are not able to do that today?

Mr. BOWSHER. No.

Senator LEVIN. OK. If you could do that also for the other seven of the Enterprise Program nominees, as you give us your analysis on how well the baselining on those has been done. If you also could tell us whether you would recommend that we authorize those other seven on a milestone authorization basis this year.

Mr. BOWSHER. Yes. Let me point out, though, Mr. Chairman, that on some of those we have done no work. So that I do not want to overpromise here what we can do in the time frame, but we will do everything possible to give you our best opinion.

Senator LEVIN. Thank you.

[The information follows:]

MILESTONE AUTHORIZATION

It was agreed with committee staff that, because of time limitations, the follow-up report provided by GAO on April 21 on the Defense Enterprise Systems nominated by DOD for milestone authorization would be sufficient for committee markup.

Senator LEVIN. Senator Bingaman.

DEVIATION REPORTS

Senator BINGAMAN. Thank you, Mr. Chairman.

Let me ask on these deviation reports. The law here—and I have a copy of it before me—says that the program manager "shall immediately submit a program deviation report for the program if there is reasonable cause to believe that the total cost of completion of the program will be more than the amount specified in the baseline description."

Are we going to be inundated with reports here? Do we need to build more flexibility in? I guess Mr. Godwin was recommending that we have a 5-percent leeway, or something there. It just seems to me that that is a fairly onerous requirement if there is any deviation from the baseline.

Mr. BOWSHER. Yes. I think what you might want to do is go with the existing law to see what your results are, because you only have a very limited number of programs being nominated.

I think at one time, the Congress legislated a 10 percent deviation on the SAR Reports. The SAR deviations might provide an indication of how big a volume you might have for enterprise programs.

At some point you probably need a deviation threshold, would be my own thought, but I would not rush to install a threshold until you have some experience with the program.

Senator BINGAMAN. Am I right that this requirement we have here now for these deviation reports applies to all the SAR programs?

Mr. CONAHAN. That is not our understanding.

Mr. BOWSHER. That is not our understanding, no. I thought it was for the Enterprise Programs.

Senator BINGAMAN. Just the Enterprise Programs?

Mr. BOWSHER. Yes.

Senator BINGAMAN. Do we need to take a vote? We are getting a lot of heads going up and down and sideways.

Mr. BOWSHER. Maybe we had better check, Senator, and let you know for sure.

Senator BINGAMAN. We should be able to figure that out ourselves. It is for all SAR systems.

Mr. BOWSHER. For all SAR systems?

Senator BINGAMAN. For all SAR systems.

Mr. BOWSHER. OK, then we might be wrong on that. We will check and confirm.

[The information follows:]

MILESTONE AUTHORIZATION

Under separate legislative requirements, both the SAR programs and Defense Enterprise programs require deviation reports if the programs exceed baseline estimates.

Senator BINGAMAN. That was the only question I had, Mr. Chairman.

Senator LEVIN. Thank you, Senator Bingaman.

Mr. Bowsher, we have asked the GAO to look at all the major acquisition programs which are scheduled for a major milestone in either of the next 2 fiscal years. We think there are about 26 programs in that category.

I am wondering whether you would recommend that any of those programs be authorized on a milestone basis?

Mr. BOWSHER. We looked at 20 systems, and the Trident II missile was the only one really that we thought had enough stability and history of good performance, that we would recommend to you.

The thing that struck me as we looked at all those programs is how few appeared to be ready for nomination. When you think of how many billions we have poured into these programs, I was disappointed.

Senator LEVIN. Did you decide that the balance should not be authorized on a milestone basis?

Mr. BOWSHER. We did not make a firm determination; but in discussions among our team, we asked the same question, and we came up with one program.

Senator LEVIN. If there are any additional ones which you would recommend, would you let us know?

Mr. BOWSHER. We certainly would.

Senator LEVIN. Because otherwise we will assume that you are basically not recommending that they be. We will understand from your silence that there is a negative recommendation of some

strength—mild, minor, or major strength—but that you have looked at them at least.

Mr. BOWSHER. Yes. If I could make an overall statement, Mr. Chairman. I know the committee is anxious to move as many programs as possible into the Enterprise Program, but our advice would be to move with some caution in selecting the programs, because this is an effort that makes a lot of sense if it can be made to work, but we should determine how a few programs work under the program.

Senator LEVIN. Senator Bingaman.

Senator BINGAMAN. Let me ask one other question. I asked Mr. Godwin about how effective we were going to be at sidestepping some of the bureaucracy with these Enterprise Programs. Do you have any thoughts as to how effective we are going to be at doing that?

Mr. BOWSHER. That is something that we ought to take a look at in a year or two, because enterprise programs will have three review levels, where you now have 10 or 12 levels of review. We should determine whether DOD can reduce management to 3 levels, whether that is the right number, and what kind of success they have because that is key to this program.

Senator BINGAMAN. Thank you, Mr. Chairman.

[Questions submitted for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR STROM THURMOND

MILESTONE AUTHORIZATION

Senator THURMOND. Mr. Godwin, it is not possible to orchestrate the development of programs to coincide with the two year budget cycle. How will the Department of Defense manage the deconfliction of milestone authorizations and the two year budget cycle?

Mr. GODWIN. The problem of inconsistency between a program's acquisition cycle and the budget process exists even in an annual system of budget submissions. The two year budget cycle may exacerbate this problem somewhat but certainly is not the cause of the problem. In order to address this inconsistency, the Department envisions a process whereby milestone authorization could be requested on a special-case basis for programs that enter full scale development or production after the official budget submission is delivered to Congress. This year, for example, the budget was officially submitted in January, but we did not request milestone authorization for any programs until March. In short, the Department will make every effort to manage the milestone authorization budget preparation processes so that there is as much consistency as possible between the two.

Senator THURMOND. Mr. Godwin, as programs reach each intended milestone, Congress may be tempted to "micromanage" the program at that point. Do you have any recommendations on how to avoid that? What are your thoughts on this?

Mr. GODWIN. The need to reduce the temptation to "micromanage" programs is one of the prime reasons for the establishment of the milestone authorization process. Under this process, appropriate programs would be authorized sufficient funds to carry the approved program through a particular acquisition stage. Congress would be joining with the Department in committing to a program at a certain baseline level. As long as the program remained at that baseline level, Congress would not be required to revisit earlier budgetary decisions. Similarly, at the prescribed baseline level, the Department would allow the program manager full authority to manage his program.

Another method for reducing the temptation to "micromanage" would be an emphasis on broad defense mission areas in the legislative review process as opposed to overly detailed line-item/program element review. Congress, of course, has a legitimate oversight role to perform; however, excessive budgetary review of the smallest

of program details is inefficient and encourages "micromanagement" on a large scale.

Senator THURMOND. Given the fact that this is the first consideration of a 2 year defense budget, and we do not know what problems lie ahead, should we forgo milestone authorizations for a few budget cycles, or do you feel that we should proceed? I would like for both witnesses to respond.

Mr. GODWIN. I feel that we should proceed, albeit cautiously. The need for initial caution was underscored in the fiscal year 1987 Authorization Act, which created the framework for milestone authorizations. Consequently, after careful review, the Department has nominated three programs for milestone authorization for fiscal year 1988. Of course, the 2-year budget cycle per se does not present any particular problems for the milestone authorization process that an annual budget cycle does not already present. There has never been perfect coincidence between the acquisition cycle of individual programs and the budgetary process. In a 2 year cycle, any off-year milestone authorization candidates could be requested in a supplemental submission.

Senator LEVIN. Thank you both.

We will stand adjourned. We will keep the record open 24 hours in case there are additional questions.

Mr. BOWSHER. Fine.

Senator LEVIN. Thank you.

Mr. CONAHAN. Thank you.

Senator LEVIN. Thank you for waiting patiently.

[Whereupon, at 3:10 p.m., the hearing was adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEARS 1988 AND 1989

WEDNESDAY, APRIL 8, 1987

U.S. SENATE, SUBCOMMITTEE ON DEFENSE INDUSTRY AND TECHNOLOGY, SUBCOMMITTEE ON CONVENTIONAL FORCES AND ALLIANCE DEFENSE, COMMITTEE ON ARMED SERVICES,

Washington, DC.

BALANCED TECHNOLOGY INITIATIVE

The subcommittees met jointly in open session, pursuant to notice, at 2:14 p.m., Senator Jeff Bingaman (chairman of the Subcommittee on Defense Industry and Technology) presiding.

Present: Senators Bingaman (presiding), Levin (chairman of the Subcommittee on Conventional Forces and Alliance Defense), Nunn, Exon, Kennedy, Dixon, Gore, Wirth, Shelby, Warner, Gramm, and Symms.

Staff present: Arnold L. Punaro, staff director; Carl M. Smith, staff director for the minority; Romie L. Brownlee, deputy minority staff director; Jeffrey H. Smith, general counsel; Patrick A. Tucker, minority counsel; Andrew S. Effron, counsel; Gerald K. Bankus, Richard D. Finn, Jr., John J. Hamre, William E. Hoehn, Jr., and Daniel J. Wildfong, professional staff members; Russell C. Miller, research assistant; Kathleen L. McGuire; staff assistant.

Also present: Edward M. McGaffigan, Jr., assistant to Senator Bingaman; Greg Weaver, assistant to Senator Levin; Jeffrey B. Subko, assistant to Senator Exon; William J. Lynn, assistant to Senator Kennedy; Charles C. Smith, assistant to Senator Dixon; Milton D. Beach and Donald A. Mitchell, assistants to Senator Glenn; Leon Fuerth, assistant to Senator Gore; James R. Sayer, assistant to Senator Wirth; Terrence Lynch, assistant to Senator Shelby; William J. Wight, assistant to Senator Warner; James M. Bodner, assistant to Senator Cohen; Mark J. Albrecht, assistant to Senator Wilson; and Samuel J. Routson, assistant to Senator Symms.

OPENING STATEMENT OF SENATOR JEFF BINGAMAN, CHAIRMAN OF THE SUBCOMMITTEE ON DEFENSE INDUSTRY AND TECHNOLOGY

Senator BINGAMAN. Why do we not go ahead and start the hearing. I think others will come in shortly. We are in the middle of a

vote on the floor and I know that there are other Senators who will be over here as soon as they have finished voting.

This afternoon, the Defense Industry and Technology Subcommittee and the Conventional Forces and Alliance Defense Subcommittee are holding a joint hearing to examine the Defense Department's plans for the balanced technology initiative which was established in the 99th Congress. This initiative grew out of a concern that many of us on the committee had last year that our defense research effort was growing imbalanced, with too much growth in the Strategic Defense Initiative, too little on our conventional defense technology base and on some of these leapfrog technologies to improve conventional capabilities.

Senator Nunn and Senator Cohen took the lead in defining these initiatives, and Senator Exon and I cosponsored the provision in last year's markup. Essentially, we reallocated about $487 million from the SDI budget to these programs, while still allowing the SDI budget to grow as rapidly as was consistent in our view with a well managed research program, designed primarily to be a hedge against Soviet activities in the ballistic missile defense area.

We have four witnesses today, two from the Department of Defense and two from the private sector. We will start with the two Defense Department witnesses, Dr. Ron Kerber and Dr. Don Fredericksen. They will give us a status report on the Department's plan for implementing the balanced technology initiative.

Dr. Kerber, of course, has been before both subcommittees. I understand Dr. Fredericksen is performing the functions of the Director of Defense Research and Engineering, in addition to his other functions. He is the Deputy Under Secretary of Defense for Tactical Warfare Programs.

Why do we not just go ahead with you two gentlemen and your testimony, and then we may have to recess briefly around 2:30. Senator Nunn has indicated he would like the full committee to consider a nomination at that time, and whenever he is ready to do that we will interrupt things. But why do we not go ahead on the assumption that he will tell us when he wants us to stop.

I will insert into the record at this point the prepared statement of Senator Levin.

[The prepared statement of Senator Levin follows:]

PREPARED OPENING STATEMENT OF SENATOR CARL LEVIN

We are holding this joint hearing this afternoon to examine how the Department of Defense is implementing the Balanced Technology Initiative established in last year's authorization act.

The purpose of creating the Balanced Technology Initiative last year was to restore balance to DOD's research and development efforts. The budget as submitted proposes to spend more on SDI than on the entire Army R&D budget. That is not balanced in my view. The purpose of the Balanced Technology Initiative was to take some of the creative energies currently being disproportionately used on strategic forces and turn them instead to conventional defense.

The United States has never enjoyed a quantitative advantage against the Soviet Union in conventional forces and we have instead relied on a qualitative superiority. Time after time we have heard that that qualitative edge is disappearing. It will indeed disappear if the bulk of our creative R&D efforts are being channeled into a narrow focus—defense against ballistic missiles.

It is important to find ways to use our technological edge to provide a credible conventional defense. That is the purpose of the Balanced Technology Initiative. That initiative is essential for a credible conventional defense in the future.

Senator BINGAMAN. Dr. Kerber, go right ahead.

STATEMENT OF DR. RONALD L. KERBER, DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ADVANCED TECHNOLOGY, ACCOMPANIED BY DONALD N. FREDERICKSEN, DEPUTY UNDER SECRETARY OF DEFENSE FOR TACTICAL WARFARE PROGRAMS

Dr. KERBER. Thank you, Mr. Chairman.

We are pleased to appear before this joint hearing today to discuss the Department's program plan for the conventional defense initiative, balanced technology initiative program that was established by the 99th Congress. The Department of Defense is dedicated to developing and maintaining a strong national defense on all fronts, and we share your commitment to conventional force modernization and enhancement of that force through the development and application of advanced technologies.

I do have a statement for the record that I would like to insert, and then I will summarize that with your permission.

Senator BINGAMAN. That will be put in the record, and any other statements that the witnesses have that they would like to have included in the record, we will be glad to include.

Dr. KERBER. The CDI/BTI program was created to focus increased attention on military technologies to provide significant advances in capability to U.S. conventional forces. The overall program was funded at $277 million for fiscal year 1987.

This includes $47 million directed to ten specific projects associated with the Army in the conventional defense area. In addition, $30 million was appropriated to a specific Navy account to continue U.S.-NATO cooperative research projects already under way.

Finally, there was $200 million appropriated to the Office of the Secretary of Defense to be apportioned to the services and defense agencies. This was authorized in section 222 of the National Defense Authorization Act. As stated in this section 222, the balanced technology initiative was established to "expand research on innovative concepts and methods of enhancing conventional defense capabilities."

During the past few months, we have been working to develop a detailed program plan consistent with those congressional directives. A special CDI/BTI program planning group was established, and this committee had representatives from research and advanced technology, from tactical warfare, from strategic and theater nuclear forces, from International programs, and DARPA, all within the Office of the Under Secretary of Defense for Acquisition.

In addition, we had representatives from the Under Secretary of Defense for Policy, from SDI, and finally from the Joint Chiefs of Staff. Numerous projects were nominated by technical experts from these organizations as candidate projects for CDI/BTI. In addition, candidate projects were suggested by the SDIO organization as potential spinoff opportunities derived from recent results in SDI.

And finally, other candidate projects were recommended by the services. In fact, we had several briefings given to us by the serv-

ices on their recommendations, and I participated personally in a series of those briefings.

Over 250 candidate projects were nominated. Those total about $2 billion. Such a response is expected from a healthy technology program where ideas and new concepts typically outnumber the resources that one has.

We asked that projects be consistent with the intent of Congress. Emphasis was given on technology areas that addressed and recognized critical conventional force needs. Projects offering both near term and long term potential for enhancing conventional forces were examined.

Joint programs were encouraged. Programs with DARPA and the services, multi-service programs, and international cooperation were given favorable review. The emphasis was on having a limited number of thrust areas. The intent of this guideline was to assure that the BTI/CDI program could make a difference in a few technologies that were critical to the conventional defense mission.

CDI/BTI PROGRAM THRUST AREAS AND FUNDING

	FY 1987
• SMART WEAPONS TECHNOLOGY	$55M
• RSTA/BMC^3 TECHNOLOGY	45M
• ARMOR/ANTI-ARMOR TECHNOLOGY	35M
• HIGH POWER MICROWAVES	15M
• SPECIAL TECHNOLOGY OPPORTUNITIES	35M

On this chart, you see the technology areas we selected. These technologies strongly support the land warfare mission. There are four technology thrust areas and another special area, called special technology opportunities which has a few other high payoff projects. The four technology areas are: smart weapons technology; reconnaissance, surveillance, target acquisition, battle management, communications, control, and command and control, which is the RSTA/BMC-3 area; the armor/anti-armor technology area; high power microwaves; and, of course, finally, the fifth area is special technology opportunities.

CDI/BTI PROGRAM PLAN

SMART WEAPONS TECHNOLOGY

OVERALL OBJECTIVE:

TO ACCELERATE TECHNOLOGY DEVELOPMENTS OF CRITICAL IMPORTANCE TO NEXT-GENERATION FIRE-AND-FORGET WEAPONS EMPLOYED BY CONVENTIONAL FORCES

- IMPROVE TARGET ACQUISITION, IDENTIFICATION, AND HIT CAPABILITIES, DEVELOP TARGET PRIORITIZATION SCHEMES
- FOR SHORT AND LONGER-RANGE ENGAGEMENTS
- PROVIDE SIGNIFICANT FORCE MULTIPLIER POTENTIAL

PRINCIPAL PROJECT AREAS:

- ADVANCED MULTI-MODE/MULTI-MISSION SEEKERS
- AUTONOMOUS GUIDANCE/AUTONOMOUS TARGET RECOGNITION (ATR)
- PRODUCIBILITY OF COMPONENTS

I will now discuss each area in a little more detail. For smart weapons technology, the objective was to accelerate the technologies critical to the development of next and future generation fire and forget weapons with a broad range of applications to engagement on the ground, in the sea, and in the air.

The idea is to develop improved target acquisition and identification and hit capabilities, together with enhanced target prioritization schemes. These enhancements will provide significant and credible force multiplier potential for both short and longer range engagements.

The principal project areas in this category include advanced multi-mode, multi-mission seekers; autonomous guidance/automatic target recognition; and the producibility of smart weapons components. Approximately $55 million of work has been identified in this thrust area.

There are projects concerned with the development of high performance seekers in the areas of infrared seekers, millimeter wave seekers, and laser guided seekers. We also are looking at enhancing the data base associated with automatic target recognition for smart weapons so that we may have image processing, multi-sensor integration, and software development for signal processing and decisionmaking in target prioritization schemes.

CDI/BTI PROGRAM PLAN

RSTA/BMC^3 TECHNOLOGY

OVERALL OBJECTIVE:

TO ADVANCE A NUMBER OF KEY TECHNOLOGIES IMPORTANT IN OBTAINING, PROCESSING, AND PASSING INFORMATION VITAL TO MAXIMIZING BATTLEFIELD PERFORMANCE OF US AND ALLIED CONVENTIONAL FORCES

- INFORMATION CAN PROVIDE A STABILIZING EFFECT IN TIME OF CRISIS
- ENHANCE PRE-CONFLICT POSTURING OF DEFENSE FORCES AND POST-ATTACK RETALIATORY CAPABILITIES (DEFENSIVE/OFFENSIVE)
- FIND, FIX, TARGET, AND ENGAGE ENEMY FORCES AND ASSETS
- PROMOTE HIGH LEVELS OF ECONOMY OF FORCE

PRINCIPAL PROJECT AREAS:

- SURVEILLANCE TECHNOLOGY
- TARGETING TECHNOLOGY
- INFORMATION MANAGEMENT

In the next area—RSTA/BMC-3 technology—the overall objective is to advance the state of the art in information and communications technologies so that we can implement for current and future concepts effective conventional force engagements in order to use our weapons and our personnel effectively in the field.

Detailed information on enemy force deployment and movement, and timely and reliable communication are key to being able to do that. The principal project areas in this category include surveillance technology, targeting technology, and information management.

Approximately $45 million has been assigned to this thrust area. A major activity in this area is a Navy underseas surveillance project, with a goal of developing new techniques and systems to maintain an anti-submarine warfare advantage. The planned program includes passive and active acoustics and non-acoustic detection.

In addition, several projects will address targeting problems, again associated with aided target recognition technology. This will involve development of a multi-spectral data base for combat vehicles. This is where we now have the automatic target recognition function on the platform as opposed to the munitions system.

We will also be looking at multi-sensor fusion theories and technologies for the design and fabrication of a prototype multi-sensor device for fusion of various input signals to the sensor.

A final area in this category is optical signal processing technology. The objective of this work is to develop improved capabilities for handling extremely high data rate input from our seeker systems and our target recognition systems. We need to do this for the

operation of our complex communications, command, and control systems and our weapons systems.

This particular technology offers possibly 100,000 times the throughput rate that we could get with traditional digital technology. We are using in this case optical processing technology as a potential replacement for digital processing technology.

CDI/BTI PROGRAM PLAN

ARMOR/ANTI-ARMOR TECHNOLOGY

OVERALL OBJECTIVE:

TO PROMOTE INCREASED SURVIVABILITY AND RETALIATORY WARFIGHTING CAPABILITY OF US CONVENTIONAL FORCES BY EXPANDING ONGOING WORK CONCERNED WITH THE DEVELOPMENT OF ADVANCED ARMOR AND ANTI-ARMOR WEAPONS SYSTEMS

- COMPLEMENTARY/SUPPLEMENTARY TO EXISTING DARPA/ARMY PROGRAM
- INCLUDES BOTH SYSTEM-SPECIFIC PROJECTS AND IMPORTANT TECHNOLOGY BASE ACTIVITIES

PRINCIPAL PROJECT AREAS:

- ADVANCED GUNS AND PROJECTILES
- ADVANCED WEAPONS
- MINE/COUNTERMINE TECHNOLOGY
- MATERIALS/PHENOMENOLOGY/MODELLING

In the next area, armor/anti-armor technology, the overall objectives are to increase the survivability of U.S. ground combat forces through the the development of advanced armor systems and to develop weapons to engage and defeat enemy land combat vehicles and other important targets. As you know, the Soviet and Warsaw Pact forces have an overwhelming numerical superiority in this area.

This program expands on the existing DARPA/Army/Marine Corps program. The BTI/CDI effort will include projects in areas such as advanced guns and projectiles, advanced weapons, mine/counter-mine technology, materials and phenomenology and modeling.

The total effort in this area is approximately $35 million.

Projects include concepts for kinetic energy projectiles and utilization of propulsion outside the gun tube to maintain or increase projectile velocity. Also, we will include studies on the fundamental impact and penetration of penetrators into armor/anti-armor protection material.

We will look at developing an advanced composite gun with a ceramic gun barrel. This will give us a gun barrel with longer wear and perhaps, if we are successful, it will have higher accuracy.

The final project that I want to discuss is the short-range anti-tank weapon project. The object of this project is to design and test a short range man-portable anti-armor weapon capable of defeating present and future enemy tank threats through the year 2000.

CDI/BTI PROGRAM PLAN

HIGH POWER MICROWAVES (HPM)

OVERALL OBJECTIVE:

TO DEVELOP A COMPREHENSIVE UNDERSTANDING OF THE EFFECTS OF HPM ON TACTICAL WEAPONS SYSTEMS TO ENSURE SURVIVABILITY OF US ASSETS AND TO HOLD POTENTIALLY VULNERABLE ENEMY SYSTEMS AT RISK

- DETERMINE SUSCEPTIBILITY OF TACTICAL WEAPONS SYSTEMS AND COMPONENTS TO HPM
- DEVELOP HARDENING TECHNOLOGY NECESSARY FOR INCREASED SURVIVABILITY OF US SYSTEMS
- DEVELOP HPM WEAPONS TECHNOLOGY FOR POSSIBLE USE ON TACTICAL BATTLEFIELD

PRINCIPAL PROJECT AREAS:

- HPM EFFECTS TESTING
- HARDENING TECHNOLOGY
- HPM SOURCE DEVELOPMENT (TESTING/SIMULATION, WEAPONIZATION)

In the higher power microwave area, we recognize that complex advanced weapons systems contain sophisticated sensors and electronic components that may be extremely sensitive to high power microwaves. We have included $15 million in the programs to make an assessment of the effects of high power microwaves on defense systems.

We intend to increase the fundamental understanding of the basic phenomenology and scaling laws associated with high power microwave effects. We hope to do well-diagnosed experiments so that we have a good understanding of the effect of high power microwaves on our defense systems.

Finally, in the last area, special technology opportunities, there were additional projects that were not identified in the major thrust areas. Representative projects in that area include advanced short takeoff/vertical landing technology associated with an ongoing cooperative NATO program; a second area is enhanced blast munitions, where we will look at fuel-air explosives for close air support, for mine clearing, and for the destruction of targets that are sensitive to high impulse loading.

We also have in this category an opportunity for exploiting a recent technological development that you may have read about in the popular press. This concerns high temperature superconductivity and adds to the work that is already in progress in the Department. Also, we have some work associated with high energy densi-

ty batteries. The total for the special technology opportunities activity is $35 million.

In conclusion we have described the process by which the BTI/CDI program was developed and presented a comprehensive overview of that plan. This process was similar in many respects to the systematic approach that we follow in our continuing development of the Department of Defense science and technology program.

Most of the work included in the plan is complementary or supplementary to ongoing work in the Department on conventional technologies. The BTI/CDI program has provided us an opportunity to focus increased attention on the development of advanced technologies in a few areas critical to conventional force affectiveness.

We view the role of the science and technology program to provide three things to the Department: capability; affordability; and survivability.

We feel that the program plan we have presented for BTI/CDI enhances those objectives. A more detailed discussion of the BTI/CDI program plan is contained in a comprehensive report that we have prepared for Congress. The report is in final preparation stages, review and coordination. We expect to provide copies of that report to the Committees on Armed Services and the Committees and Appropriations by the end of the month.

That ends my formal remarks, and we would be happy to answer any questions that you have.

[The prepared statement of Dr. Kerber follows:]

PREPARED STATEMENT OF DR. RONALD L. KERBER
and MR. DONALD N. FREDERICKSEN

Mr. Chairmen, Distinguished Members of the Subcommittees:

We are pleased to appear before this joint hearing of the Subcommittee on Defense Industry and Technology and the Subcommittee on Conventional Forces and Alliance Defense to discuss the developing Department of Defense plan for the Conventional Defense Initiative/Balanced Technology Initiative (CDI/BTI) program established by the 99th Congress. The Department of Defense is dedicated to developing and maintaining a strong national defense on all fronts, and we share your committment to conventional force modernization and enhancement through the development and application of advanced technology as an important part of our continuing efforts to ensure the national security of the United States and the well being of our Allies now and into the future.

The CDI/BTI program was created to focus increased attention on the development of military technologies capable of providing significant advances in the capabilities of US conventional forces. The overall program was funded by an appropriation of $277 million for Fiscal Year 1987. This amount includes $47 million appropriated directly to Army accounts for 10 specific conventional defense projects, e.g., for work on the development of a ground-launched HELLFIRE missile system, and for an evaluation of the utility of remote pilotless vehicles (RPVs) on the tactical battlefield; $30 million appropriated to a single Navy account for continuation of US/NATO cooperative research and development projects initiated in Fiscal Year 1986, e.g., for work on advanced sea mines, and for development of surface ship torpedo defense capabilities; and $200 million appropriated to the Office

of the Secretary of Defense (OSD) for apportionment to the Services and the Defense Agencies. These latter funds are for work authorized in Section 222 of the National Defense Authorization Act for Fiscal Year 1987, which describes the Balanced Technology Initiative (BTI). Our subsequent comments today will address the BTI program.

As stated in the aforementioned Section 222, the Balanced Technology Initiative was established to "expand research on innovative concepts and methods of enhancing conventional defense capabilities," emphasizing areas such as armor/anti-armor technology, anti-submarine warfare, and smart munitions; and to facilitate "restoration of the conventional defense technology base." For the past few months we have been working to develop a substantive detailed program plan consistent with those Congressional directives. A special CDI/BTI program planning committee was created for this purpose, with representatives from the Research and Advanced Technology, Tactical Warfare Programs, Strategic and Theater Nuclear Forces, and International Programs and Technology organizations within the Office of the Under Secretary of Defense for Acquisition; and from the Office of the Under Secretary of Defense for Policy, the Defense Advanced Research Projects Agency (DARPA), the Strategic Defense Initiative Organization (SDIO), and the Organization of the Joint Chiefs of Staff.

Numerous projects for the CDI/BTI program were nominated by appropriate technical experts who are members of the organizations named above. These projects covered a broad range of activities, including advanced weapons concepts and important technology base work. Candidate project areas suggested by SDIO were presented as technology spinoff opportunities derived from recent SDI developments that clearly have relevance to conventional defense

problems. These suggestions included projects in the areas of hypervelocity guns and projectiles, software development tools/secure software engineering, advanced electronic materials, high power microwaves, high performance multiprocessors, advanced sensors and seekers, tactical lasers, communications systems components and security, intelligence interfaces, and kinetic energy and laser weapon lethality. The CDI/BTI program plan includes work in a number of these areas.

In addition, many other candidate projects were recommended by the Services. Specific CDI/BTI program recommendations and priorities were formally requested through the Assistant Secretary of the Army for Research, Development and Acquisition; the Assistant Secretary of the Navy for Research, Engineering and Systems; and the Assistant Secretary of the Air Force for Research, Development and Logistics. Extensive interactions between the committee and Service representatives followed. Written program recommendations were received in late November 1986 and subsequently reviewed by the committee. Service briefings on these recommendations were presented in December 1986, and in January 1987, to describe the selection process and prioritization, and to provide requested information on related work in progress, program continuity beyond Fiscal Year 1987, and coordination of proposed CDI/BTI projects with other Services.

Overall, approximately 250 candidate projects nominated by OSD organizations, Defense Agencies, and the Services were considered in developing a detailed plan for the CDI/BTI program. The total Fiscal Year 1987 cost of these candidate projects was more than $2 billion. Guidelines were developed to aid in the evaluation and selection process. Projects were required to be consistent with the intent of Congress as stated in Section 222 of the Authorization Act for Fiscal Year 1987. Emphasis was given to

technology areas that addressed recognized critical conventional force needs, to the general exclusion of chemical, biological, and nuclear programs. Projects offering both near-term and longer-term potential for enhancing conventional force capabilities were also emphasized. Preferred candidates were considered to include projects complementary to ongoing work that offered the possibility of high payoff in military effectiveness through additional funding. Joint programs (e.g., DARPA/Services, multi-Service, or involving international cooperation) were encouraged. Finally, emphasis was given to projects supporting a limited number of thrust areas for the overall program. The intent of this guideline was to ensure that the CDI/BTI program could "make a difference" in a few technology areas critical to conventional defense missions.

The program plan we have developed includes four such thrust areas, together with a number of other important projects offering high payoff potential identified in the selection process. These thrust areas are: Smart Weapons Technology, intended to promote the development of technologies that can ultimately provide significant improvements in target acquisition capability for a broad range of munitions; RSTA/BMC^3 Technology, a category merging two widely used acronyms (RSTA, for Reconnaissance, Surveillance, and Target Acquisition; and BMC^3, for Battle Management, Communications, Command, and Control) that addresses enabling technologies for obtaining, processing, transmitting, and using information essential to the effective deployment and utilization of conventional defense resources; Armor/Anti-Armor Technology, intended to be both complementary and supplementary to the recently established cooperative DARPA/Army/Marine Corps program in this area; and High Power Microwaves (HPM), intended to develop a comprehensive understanding of the effects of HPM on tactical weapons systems to ensure the survivability of US assets and to

place potentially vulnerable enemy systems at risk. The fifth program category is called Special Technology Opportunities.

Smart Weapons Technology

The overall objective of work to be initiated in the Smart Weapons Technology thrust area is to accelerate the growth of technologies critical to the development of next- and future-generation fire-and-forget weapons required for a broad range of ground, sea, and air engagements by conventional forces. The development of improved target acquisition, identification, and hit capabilities, together with enhanced target prioritization schemes, represents a giant step toward overcoming the troublesome quantitative superiority of Soviet and Warsaw Pact forces in Europe. These enhancements in conventional defense capabilities also provide significant and credible force multiplier potential for both short and longer-range engagements. Principal project areas in this category include advanced multi-mode/multi-mission seekers, autonomous guidance/automatic target recognition (ATR), and the producibility of smart weapons components. Our CDI/BTI program plan includes approximately $55 million for work in this thrust area.

Projects concerned with the development of high performance seekers include work involving infra-red (IR), millimeter wave (MMW), and laser technologies. For example, the Millimeter Wave Seeker Demonstration project, to be conducted by the Air Force, seeks to demonstrate the capabilities of this technology, weaponized to the AGM-65 (Maverick) airframe. The objective of this project is to enhance target acquisition and kill probability for standoff weapons fired against mobile and fixed air-defense units and battlefield/second-echelon massed armor. MMW seekers offer all-weather, long standoff, lock-on-after-launch

capabilities necessary for these missions. The Joint IR/Laser Seeker project, to be executed by the Army and the Navy, will develop a dual mode seeker of potential benefit to a number of existing weapons, including the MAVERICK, HELLFIRE, and COPPERHEAD systems. This advanced seeker will provide a significant improvement over present laser-guided weapons. The laser seeker would be used for target acquisition, and the IR seeker along with the laser would be used for subsequent tracking to intercept, or in a fully autonomous mode when the laser designators are not available.

Air Force work in the Smart Weapons Technology area will also include a project called Autonomous Guidance for Conventional Weapons. The objective of this work is to exploit near-term, lock-on-after-launch seeker technology in aircraft-delivered weapons to provide precision accuracy and survivable surgical strike capabilities against high value fixed targets. These features, combined with standoff delivery, provide a force-multiplier effect by permitting multiple targets to be addressed in a shorter interval and by increasing force survivability. Automatic Target Recognition (ATR) for Smart Weapons is a DARPA/Army project that will include important fundamental studies of image processing, multi-sensor integration, software development for signal processing and decision-making/target prioritization schemes, ATR system architecture development, and the development, evaluation, and testing of ATR system components.

Several projects will address problems encountered in producing smart weapons components. For example, work managed by DARPA on a project called Monolithic IR Focal Plane Arrays will accelerate the development of large area growth techniques of materials used in IR sensor arrays. Another project, Expert Systems for Manufacture of Smart Weapons Components, will develop

and optimize automated processes for the fabrication and assembly of complex electronics components and subsystems that can both improve the quality and reliability of smart weapons systems and significantly reduce per-unit production costs.

RSTA/BMC^3 Technology

The overall objective of the RSTA/BMC^3 Technology thrust area is to advance the state-of-the-art in information and communications technologies important to the successful implementation of current and future concepts for effective conventional force engagements, including Air/Land Battle. Detailed information on enemy force deployment and movement, timely and reliable communication of that information to field commanders, thorough coordination of responsive operations for maximum economy of force, and precise targeting of enemy assets are required. Associated technological demands cover a broad spectrum of sensor performance, signal processing, and communications systems requirements. Principal project areas in this category include surveillance technology, targeting technology, and information management. The CDI/BTI program plan includes approximately $45 million for work in this thrust area.

A major activity in the RSTA/BMC^3 Technology category is an Undersea Surveillance project, which involves expansion of important Navy research in this area. The work will supplement and accelerate important submarine surveillance investigations included in a recently initiated Advanced Antisubmarine Warfare (ASW) Development program directed by the Chief of Naval Operations. Significant improvements in US submarine-detection capabilities, which require the development of both new techniques and systems, are needed to maintain an ASW advantage based on large-area surveillance rather than on expensive, short-range

tactical sensors. The planned program includes work in passive and active acoustics, non-acoustic detection, environmental assessments, and ASW system architecture and engineering.

Several projects will address targeting problems. For example, an Aided Target Recognition (ATR) Technology project, to be conducted by the Army, will develop an improved understanding of ATR phenomenology and technical issues critical to the development of militarily useful ATR systems. Specific work will include the development of a multi-spectral database of combat vehicles deployed in combat environments, development of multi-source ATR and multi-sensor fusion theories, and investigation and advancement of the technologies required for design and fabrication of a prototype multi-sensor fusion system. Another project, Fiber Optic Data Link for Air-Launched Weapons, involves Navy work to improve targeting capabilities by eliminating a number of problems characteristic of current weapon data links: high cost, susceptibility to jamming, platform location broadcasting, and pod drag. If feasibility studies are successful, weaponized versions will be developed for various air-launched weapons.

Information management activities in the RSTA/BMC^3 Technology thrust area include an Optical Signal Processing (OSP) Technology project. The objective of this work is to develop improved capabilities for handling extremely high data rates required for operation of complex communications, command, and control systems and weapons systems of the future. Projected OSP computational capabilities are as much as 100,000 times greater than rates achievable with electronic digital processing.

Armor/Anti-Armor Technology

The overall objectives of the projects included in the Armor/Anti-Armor Technology thrust area are to increase the

survivability of US ground combat forces through the continuing development of advanced armor systems, and to develop weapons to engage and defeat enemy land combat vehicles and other important targets. Soviet and Warsaw Pact forces possess a potentially overwhelming numerical superiority that to date has been addressed by a US/NATO technological advantage. Maintaining this advantage is becoming increasingly difficult in the face of continuing improvement of Soviet capabilities. The previously mentioned DARPA/Army/Marine Corps program seeks to counter these Soviet advances, but much additional work must be done to address this serious threat. The CDI/BTI efforts will include work in four principal project areas: advanced guns and projectiles, advanced weapons, mine/countermine technology, and materials/ phenomenology/modelling. The CDI/BTI program plan includes approximately $35 million for work in this thrust area.

Several projects are concerned with the development of advanced guns and projectiles. An Enhanced Kinetic Energy Weapons project, to be managed by DARPA, will explore several concepts for kinetic energy projectiles that utilize propulsion outside the gun tube to maintain or increase projectile velocity, providing for an increase in range and/or effectiveness on target. Work will also include studies of fundamental impact and penetration phenomena, and an assessment of methods for improving present kinetic energy penetrator weapons. Other DARPA work, the Advanced Composite Gun project, will develop an advanced, high-performance gun that utilizes ceramic and composite materials. Potential improvements, important to conventional forces, include reduced barrel erosion, increased rates of fire, longer sustained fire, increased projectile velocity, and greater accuracy. Investigation of this concept was recommended in a recent report by the National Materials Advisory Board of the National Academy of Sciences.

The Short Range Anti-Tank Weapon project is an important advanced weapons activity in the Armor/Anti-Armor Technology thrust area. The objective of this effort, which will be carried out by the Army, is to design and test a short-range, man-portable, anti-armor weapon capable of defeating present and future enemy tank threats through the year 2000. A simple, inexpensive, unguided, shoulder-launched weapon has been proposed, with initial designs to consider the use of proven components. A "fly-over-shoot-down" attack mode will be explored. The CDI/BTI program will also provide additional required support for the Ground-Launched HELLFIRE project, an Army CDI project directed by Congress. Other weapons projects include Advanced Mine Concepts, with proof-of-principal testing and prototype demonstrations; Amphibious Assault Countermine System, to address an important Marine Corps need; and Armor Materials, to develop new, more cost-effective processing techniques for high-performance ceramics used in advanced armor systems.

An important conventional defense technology base program with broad applicability, Enhanced Computational Capabilities for Advanced Weapons System Development, has been incorporated into the Armor/Anti-Armor Technology thrust area. This program will be a joint DARPA/Army/Navy effort to develop a more detailed understanding of the response of real materials to dynamic loading and to formulate physically-based deformation and fracture models for use in solving large-scale computational mechanics problems. Complex problems requiring this computational capability are encountered in designing advanced armor systems and munitions, including shaped charge warheads, explosively formed projectiles, and kinetic energy penetrators. Reliable computational results can greatly accelerate the development of advanced weapons systems by permitting the use of more sophisticated designs, by allowing preliminary complex design evaluations to be completed in a timely

and cost-effective manner, and by aiding in the interpretation of later experimental results of tests conducted as part of the usual weapon effectiveness evaluation process.

High Power Microwaves

Complex advanced weapons systems, which contain sophisticated sensors and electronics components, may be extremely sensitive to high power microwaves. High power microwaves could be produced from a variety of sources for ground-based or airborne weapons systems, and are likely to be of increasing importance in future conventional engagements. This thrust area was included in the CDI/BTI program to address critical HPM effects and phenomenology issues. Our CDI/BTI program plan includes $15 million for this work.

The overall plan for the High Power Microwaves thrust area was established by technical experts from the Office of the Secretary of Defense, the Defense Nuclear Agency, and the Services. This approach was taken to ensure development of a significant and coordinated effort complementary to ongoing investigations. The CDI/BTI activity will enhance present HPM effects work by developing improved laboratory simulation capabilities, by increasing fundamental understanding of basic phenomenology and scaling laws, and by upgrading modelling tools for analyses of tests. Work will also include a systematic assessment of the susceptability of modern weapons systems and components to HPM, development of a cost-effective and maintainable hardening technology to enhance survivability of US and Allied systems, and limited exploratory efforts involving HPM weapons concepts.

Specific HPM activities will be conducted by the Services and the Defense Nuclear Agency (DNA). Phenomenology and methodology studies will be carried out by the Air Force. Phenomenology,

effects testing, required component development, and propagation efforts will be managed by DNA. Other effects and component development activities will be carried out by the Services, including susceptibility tests of TOMAHAWK and HARPOON missiles by the Navy at the new Capistrano Test Site.

Special Technology Opportunities

Certain additional projects not identifiable with the four major thrust areas described above have also been included in the CDI/BTI program plan. All of these projects have significant potential for enhancement of conventional defense capabilities, and they were incorporated into a fifth program category called Special Technology Opportunities. Representative projects include Advanced Short Take-Off/Vertical Landing Technology, to provide additional required support for an ongoing NATO cooperative program concerned with the advancement of key technologies pertinent to the development of highly maneuverable and survivable aircraft; Enhanced Blast Munitions, to reevaluate the weapons potential of improved fuel-air explosives for use in certain special purpose missions such as close air support, mine clearing, and destruction of impulse-sensitive targets (e.g., fuel depots, buildings, and bunkers); High Temperature Superconducting Materials, to fabricate such materials into thin films and composite forms needed for a broad range of advanced weapons system applications; and Terminal Intercept Missile for Tactical Missile Defense, to develop a surface-to-air, command-guided, highly-maneuverable, hit-to-kill interceptor. The CDI/BTI program plan includes approximately $35 million for work in this category.

Concluding Remarks

In this Department of Defense statement on the Conventional Defense Initiative/Balanced Technology Initiative, we have

described the process by which our CDI/BTI program plan was developed and presented a comprehensive overview of that plan. The process was similar in many respects to the systematic approach we follow in our continuing development of all aspects of the Department of Defense Science and Technology Program. Representative projects included in the CDI/BTI program plan were also described. Most of the work included in the plan is complementary or supplementary to ongoing related efforts within the Defense Agencies and the Services. Thus, the CDI/BTI program has provided an opportunity to focus increased attention on the development of advanced technologies in a few areas of critical importance to conventional defense. We are confident that the program will make positive contributions to the capabilities of US conventional forces.

More detailed discussion of the CDI/BTI program plan is contained in a comprehensive report to Congress we have prepared in accordance with requirements outlined in Section 222 of the National Defense Authorization Act for Fiscal Year 1987. This report has recently been completed and is presently undergoing review and coordination within the Department of Defense. We expect to provide copies to the Committees on Armed Services and to the Committees on Appropriations soon.

Senator BINGAMAN. Before we take any questions, why don't you go ahead, Mr. Fredericksen.

Mr. FREDERICKSEN. I do not have a statement to make.

Senator BINGAMAN. You do not have anything to add, okay.

I will start with a couple of questions. Senator Levin, you are co-chairing this event, so let me call on you as soon as I have asked a question or two.

KEY TECHNOLOGIES

Dr. Kerber, you gave us a chart showing the 20 most important technologies from your point of view. As I understand it, the Air Force has a list that they have identified as the most significant for Project 2000, and I just wondered if there are other lists of key technologies in the Department of Defense, and whether someone has tried to prepare a matrix of these to see what kind of consensus we have.

Or do you see your list as representing a consensus?

Dr. KERBER. I think in effect our list does represent a consensus. We have several lists, and we have compared those very carefully. The first list that I presented in a previous hearing was associated with a 1981 Defense Science Board study on 17 technologies considered to be those that could make a difference.

The second chart I presented in that same hearing was actually prepared by Mr. Fredericksen, which were the technologies he felt would make a difference in the future for our tactical systems.

The third area you are referring to is a Project Forecast of the Air Force. We have looked at the mix of the technologies on those lists of opportunities, and in a sense all those technologies are either strongly funded in the existing program or funded within the Strategic Defense Initiative.

Also, if you look at those lists, they are representative in many cases of technologies that we have selected to enhance and expand on in CDI.

Senator BINGAMAN. Is it possible to really break out those in your priority list which this balanced technology initiative is focusing on? I mean, have you done that, tried to identify how the balanced technology initiative funding impacts on your key technology list?

CDI/BTI PROGRAM

Dr. KERBER. Yes, we have looked at that. We have looked at a matrix of what we are currently funding. In fact, in deciding what we were going to fund in the CDI/BTI program, we looked at those technologies that would make a difference. We went over those lists and looked at what we thought we could do to accelerate work that we have ongoing and to see if we had any other areas that were new and key.

Now, there are certain areas that of course are not in the CDI program. The CDI program really takes advantage of smart munitions because we have an electronics capability in this country that is far superior to the Warsaw Pact and, also, because we have a computing capability and a software capability that is far superior.

So we have developed a competitive strategy in the CDI/BTI program to take advantage of that situation.

Senator BINGAMAN. Are you satisfied that we have sufficient procedures built in to avoid duplication of work in the various things that are being funded through the Department of Defense, DARPA, or one of the services, so that we do not have two people or two groups essentially doing the same thing?

Dr. KERBER. Yes, I am, and let me comment on that. On the particular submissions for this program, we asked that everyone who submitted a concept or an idea to submit with it current activities in that area and how this would either complement it or supplement that particular activity. That was a requirement for someone to submit an idea to this particular activity.

Of course, in our general review of the science and technology program, we conduct topical reviews of each technology each year and we then conduct an investment strategy review, which is an overall look at the Department's resources in the science and technology program.

OVERDUE REPORT

Senator BINGAMAN. Let me ask about the report that we required in last year's authorization bill. I guess it is somewhat overdue at this point. Could you elaborate on the reasons why?

We had asked that it be submitted within 90 days of enactment of the statute. Could you maybe comment on what problems you encountered in getting that report done?

Dr. KERBER. I think the answer is quite simple. The task was to make sure that we did exactly what you wanted. That is, to fund technologies that really made sense, to ensure that we were complementing our existing program and not duplicating, and to ensure that we had ideas bubble up from the technology in the right mix. It took us more than 90 days.

So we had a choice of either giving you a report in 90 days or giving you a good one at the end of this month. We chose to give you a good one at the end of this month.

We are extremely proud of what we have done in developing the BTI program and have no reservations about what we are presenting here today.

SUPERCONDUCTIVITY

Senator BINGAMAN. On the superconductivity that you referred to in your statement, could you elaborate a little on this, on the work that is being done in the Department of Defense, and what additional emphasis you are giving that area in light of some of the additional breakthroughs that have occurred in the last six months?

Dr. KERBER. We have had ongoing work for approximately 30 years in superconducting materials. In fact, the director in one of my offices, Research and Laboratory Management, was personally involved in superconductivity research some time ago.

We have work going on now that is being re-examined based on the activity that we have recently seen, both in this country and internationally, in raising the temperature of superconductivity.

There have been conflicting reports about exactly how high that temperature has risen.

There are certain materials such as lanthium, strontium, and copper oxide, that have raised the temperature from say 30 degrees to 50 degrees to maybe 100 degrees Kelvin. That gives us an opportunity to look at doing other things with superconductivity.

We are putting as many resources as we think we can wisely spend in that area. We are going to have a group consisting primarily of fundamental research individuals look at what opportunities there are in that area by expanding ongoing projects.

Senator BINGAMAN. My time is up. Thank you.

Senator LEVIN.

PROJECTS FUNDED UNDER BTI

Senator LEVIN. Just a few additional questions. You indicated in your testimony that 250 projects were nominated for funding under BTI. Can you tell us how many of these 250 nominees are actually being funded?

Dr. KERBER. Approximately 35 to 40 of the candidate projects were selected.

Senator LEVIN. And has any of the money authorized for this program been obligated for those 35 or 40 projects which have been approved?

Dr. KERBER. Do you mean have we gone a step down in selection of the projects?

Senator LEVIN. Yes.

Dr. KERBER. We are just now doing that. There is no money to the agencies or services at this time.

Senator LEVIN. So you have not obligated any funds yet?

Dr. KERBER. No.

Senator LEVIN. And of the ones that were rejected, how many were rejected because they were not feasible? How many were rejected because they were not leap-ahead alternatives? How many were rejected purely for funding, lack of funding? Can you give us that breakdown for the record?

Dr. KERBER. Yes, I could do that for the record.

[The information follows:]

REASONS FOR PROJECT REJECTIONS

More than 250 candidate projects were reviewed in developing a program plan for the Balanced Technology Initiative. In an initial screening, some of these candidates were considered to be duplicative of ongoing work, some were judged to be of too high risk, some were thought to offer too little payoff beyond present capabilities, and still others were given low priority for a combination of reasons. Some 40 projects were finally selected following a process that emphasized critical technology development and conventional defense needs. The selected projects were considered to have higher priority than the remaining candidates based on selection guidelines developed and applied as part of the overall planning process. The principal project selection guildelines are described in our prepared statement.

Senator LEVIN. So that of the 190 roughly that were rejected, could you try to categorize?

Dr. KERBER. Yes, we will do that.

Senator LEVIN. Now, are you going to spend all the $200 million in 1987?

Dr. KERBER. Of the $200 million, there was $182 to $185 million that will be obligated in fiscal year 1987.

Senator LEVIN. And how much will it take to complete those programs in later fiscal year budgets?

Dr. KERBER. I can give you the number for fiscal year 1987. We anticipate on the order of $277 million for fiscal year 1988, and we have assured ourselves that is currently in the President's budget.

Senator LEVIN. Where is it?

Dr. KERBER. When we asked for the technology nominations from the services and agencies, we asked them to identify how that would fold into the out year budget.

Senator LEVIN. So that they have identified for you where in the 1988 budget that $277 million is?

Dr. KERBER. Yes, and the Department is committed to fund that in the out years.

Senator LEVIN. But I am just talking about 1988 now.

Dr. KERBER. 1988.

Senator LEVIN. Has that been submitted to our staff, do you know?

Dr. KERBER. No, it has not. We will make it part of our report, which is a requirement of the legislation.

Senator LEVIN. That would be good.

Thanks so much.

Senator BINGAMAN. Senator Warner.

Senator WARNER. Mr. Chairman, I wish to compliment our witnesses and their colleagues today for this very important work that they are doing. If this Nation is successful in the arms control arena, greater emphasis will be placed on conventional weapons technology, and you are on the cutting edge of that.

ADEQUATE FUNDING LEVELS

My question is, do you think the funding levels are adequate?

Dr. KERBER. Yes, we do. The reason for that is, as you know, a good science and technology program always has an abundance of ideas. However, the Department has priorities which have to fit not only the development of technology, but the exploitation of that technology and the development of specific weapons systems and the operation of our services and our Armed Forces. We have to follow those priorities.

You will always find in a well-run science and technology program more ideas that you can fund.

Senator WARNER. Well, I have recently received some private briefings of a classified nature on certain areas of this work, and it caught my interest to the extent that I will be looking more actively to see if we have sufficient funding in these areas.

I thank the chairman and I thank the witnesses.

Senator BINGAMAN. Senator Nunn, did you have questions of these witnesses?

Chairman NUNN. Mr. Chairman, I do have a couple of questions, pursuing what Senator Warner just asked about the money.

How much money, Dr. Kerber, do we need to follow on what is already started here that you have described, and how much is in the budget for that purpose?

Dr. KERBER. I can give you the number for fiscal year 1988 which is approximately $270 to $300 million, and that is in the President's budget.

Chairman NUNN. That is in the budget?

Dr. KERBER. Yes.

Chairman NUNN. Does that mean we have any new money or is that simply these projects that are being funded in terms of follow-through?

Dr. KERBER. These projects will be folded into the 1988–89 budget submission.

Chairman NUNN. The new projects?

Dr. KERBER. Yes.

What they are allowing us to do is accelerate and complement existing programs and take advantage of things we would not have been able to take advantage of without the CDI funding.

Mr. FREDERICKSEN. In many cases, the money allowed us to start much earlier than we would have otherwise, like a year earlier in important projects.

Chairman NUNN. You are saying you have enough money in this budget as presented by the President to follow through and carry on with the programs that you have now started?

Dr. KERBER. That is correct. The Department is committed to doing that, and when we requested nominations for the fiscal year 1987 dollars we requested that everyone indicate how they would support that in the out years. That was a condition for a nomination.

Chairman NUNN. Is the money specifically designated in the budget as such, or is it just that they are going to find the money?

Dr. KERBER. It is not specifically designated, but it is associated with a specific program element that the person who submitted the technology has identified for the continuation of the effort.

Chairman NUNN. Thank you.

Mr. Chairman, I do not want to take any time. At some point—I do not want to interrupt the flow of this, but if we could, maybe when we conclude with these witnesses, we are going to have a quorum and I would like to take up two other matters unrelated to this that we have got to move on, including the nomination of the Secretary of the Navy.

Senator WARNER. Mr. Chairman, if I might respond to Senator Nunn, I think several of our members are here for that purpose. I wonder if you might caucus the members to determine their availability at a time at the conclusion of the questions.

Chairman NUNN. Well, I guess the easy question is, can all of you wait for another 10 or 15 minutes, or do you need to move at this point?

Senator SYMMS. I would rather do it now, Mr. Chairman. I have to testify at 3 o'clock.

Senator WARNER. I asked our side to come.

Chairman NUNN. Well, Mr. Chairman, could we go into full committee?

[Whereupon, at 2:15 p.m., the hearing was recessed and the committee proceeded to other business, the subcommittees reconvene at 3:15 p.m.]

Senator LEVIN. Senator Wirth, did you have an opportunity to ask questions of these witnesses?

Senator WIRTH. No.

Senator LEVIN. All right, do we have any further questions of our witnesses before we excuse them?

MONEY FOR EXISTING PROGRAMS

Chairman NUNN. I have one more question. We were talking a minute ago about the budget and whether you had the money in there and so forth. My understanding—correct me if I am wrong—but basically, you did not have the money in the budget for the follow-on of these new programs that have started; is that right?

Dr. KERBER. This is the situation. The Department received the CDI/BTI program from Congress. We responded to that, and we have pledged fiscal year 1988 funds and beyond in the Department budget. To do that we folded the funds into existing programs. In some cases we will reprogram and extend programs already ongoing so that we can account for these resources.

So it is either folding this activity into existing programs or reprograming. As you know, the science and technology program is essentially a level of effort program. As we increase or decrease the level of effort we tend to extend or prolong or accelerate, depending upon whether the resources go up or down in what we are doing.

Chairman NUNN. What you are saying is if you are going to find the money, you are going to have to find the money from some other program or some other slip in the program, or incorporate it in an ongoing program or reprogram?

Dr. KERBER. Yes, we are going to either extend programs——

Chairman NUNN. It is another way of saying the money is not in the budget, but you think you can find it. Is that not what you are saying?

Dr. KERBER. We are committed and pledged to find it.

Chairman NUNN. And I assume that your testimony would be that if we help you find it you would not object? [Laughter.]

Dr. KERBER. Sir, I would like to appear before you in future testimony. We are committed to support this program in the out years.

Chairman NUNN. Thank you.

Senator LEVIN. Pursuing that subtly just for a moment——

[Laughter.]

Senator LEVIN. You are committed, as I understand it, to find money in this year's budget, and I think we are, too, to continue the 1987 program. And when I say this year's budget, I am talking about 1988.

Dr. KERBER. We did not ask you for help.

Senator LEVIN. But there is another question, and that is, you need whatever that figure was, I think $185 million or whatever the figure was, to continue in 1988 the 35 or 40 programs? Excuse me, you need $300 million in 1988 roughly to continue the programs which were approved in the 1987 budget.

My question is this. You have identified 35 programs, I believe you said, roughly. And your approach would mean that there would be no additional programs funded in 1988 or the out years?

Dr. KERBER. That is correct.

Senator LEVIN. At best, all we would be doing is continuing those 35 programs, assuming we can find the money in the 1988 budget to do that?

Dr. KERBER. We are committed to funding those efforts. There are no new programs planned in 1988 and beyond above what we have shown here.

Senator LEVIN. Now, if this program is such a success—and I think most of us feel it has that potential at least. When Senators Nunn and Cohen proposed this program, I think it kind of caught the imagination of this committee, and indeed the Congress. And the House, of course, has done something similar.

But I must say that I am troubled more by the lack of funds in 1988 for continuing this with new programs in a way than I am with the lack of a precise identification in the 1988 budget for continuing the 1987 starts, because there you have made a commitment that you are going to find the money and we may help you, as Senator Nunn says.

Now, if it is such a success—and it looks like it is going to be—and if this is the cutting edge and if we have got to do with quality what we cannot do with quantity, and if we want a conventional deterrent, to the extent we can come up with a conventional deterrent to reduce our reliance on nuclear weapons and to make arms control agreements feasible and all the other things we talk about around here, why should you not be requesting money for more new starts in 1988?

Dr. KERBER. I think you have to recognize that it is essentially a recognition of priorities. As I indicated before, the science and technology program is in general a level of effort program. We have capabilities and resources to put in the science and technology program, but then we also have to look at exploiting that technology by developing systems, and we have to support the fielded forces.

It is a matter of tradeoffs, and the Department has made those tradeoffs.

Senator LEVIN. Thank you.

Senator Wirth.

Senator WIRTH. Thank you, Mr. Chairman.

Dr. Kerber, I am sorry I was not here for your oral testimony earlier, but I had the responsibility of chairing the floor for that hour. I wondered if I might ask you a question based on my earlier review of your testimony.

CDI AND THE BALANCED TECHNOLOGY INITIATIVE

It concerns what I understand is the distinction between the CDI and the balanced technology initiative. It is my understanding that, when the CDI program was put together, one of the major emphases was to assure that we were doing everything we could to look for advanced technology programs that were already developed that we might be able to put to use in our defenses. Is that not correct?

Dr. KERBER. That is correct.

Senator WIRTH. Much of that was to focus on what our allies might be doing, is that right?

Dr. KERBER. It was not just the allies, but also looking at specific technologies and accelerating those that were more near term than the balanced technology initiative language.

Senator WIRTH. In your testimony, what comes through, again, after a quick review, is the emphasis on BTI and the development of sophisticated new technologies.

What kind of effort has gone into evaluating advanced weapons programs that have already been put together by our allies?

Dr. KERBER. We are continually evaluating those programs. We have a series of NATO working groups that do that assessment, both from a technological and a weapons point of view, all the time.

Senator WIRTH. Could you elaborate on that?

Mr. FREDERICKSEN. Under the CDI program, MILAN, for example, has been identified as a foreign system to be tested this summer.

Senator WIRTH. Would that have been done without CDI?

Mr. FREDERICKSEN. I am not clear.

Senator WIRTH. What has the CDI initiative led you to do that you would not have done otherwise?

[No response.]

Let me ask the question another way. Why do we have CDI on the books? I thought there was extensive report language in the fiscal year 1987 authorization that focuses on—and maybe I am incorrect in this, Mr. Chairman—available advanced technologies. It is my understanding that one of the things that the Department of Defense had been asked to do was to look at technologies that have been developed by our allies, to see what could be used here.

Efforts in this regard do not seem to come through here.

Dr. KERBER. Let me comment on that. There are about three points. In fact, if you look at the specific lines, Mr. Fredericksen indicated one. There are efforts in there, other efforts associated with other allies.

I could pick out a few of the projects. In fact, maybe the best thing to do is to give the majority of those for the record. In my opening remarks, I indicated that the priorities on selection of projects were projects that had a multi-service component or projects that were going to be developed by an agency and a service, or projects that had international cooperation in mind.

In fact, there are several projects—there is one on a missile intercept concept that has about $10 million to be developed in connection with one of our allies. In the total appropriation, $277 million, $30 million was specifically for the Navy for NATO cooperative program activity.

So, if we went through we could identify a significant amount of resources that have an international technology cooperation flavor.

Senator WIRTH. Am I incorrect in my understanding that one of the purposes was to evaluate and look at technologies that were already developed, that we might bring into use in our Armed Forces? Was that not one of the purposes?

Dr. KERBER. The purpose was to do that for SDI, and we were encouraged to do that for the international technologies. Of course, we do that routinely.

Senator WIRTH. If in fact you do it routinely, Mr. Kerber, then we ought to be able to have a list of what weapons systems have already been developed that you have been evaluating.

Dr. KERBER. I can give you that.

Senator WIRTH. Well, why do you not go ahead and do that. Why do you not tell me what two or three or four of those examples are? Or maybe they are not important enough to bother with doing this, and we ought to eliminate CDI from the requirements of the Defense Department.

Dr. KERBER. I would prefer to do that for the record, so that I can do it precisely for you.

Senator WIRTH. You do not have any examples that you can use? MILAN was one that was referred to by Mr. Fredericksen, and he said maybe that would have been done otherwise.

I am not being difficult. I am just asking you a simple question.

Dr. KERBER. There is a cooperative project that we have in here associated with the technology we are exploiting with Israel, that is associated with intercepting an incoming missile to any of our conventional resources. That particular technology is supported as part of this BTI program.

If you want more examples, there are several more that we can give for the record.

Senator WIRTH. Are these classified programs?

Dr. KERBER. In general, no.

Senator WIRTH. Well, maybe you had better do that for the record, Dr. Kerber. I am still not having a sense that in fact there has been an effort made on this front. I mean, you mentioned the MILAN thing and we have identified one potential technology from Israel.

Haven't our allies developed anything else that you know of?

[The information follows:]

ALLIED CONSIDERATIONS IN CDI/BTI

In evaluating projects to be included in the CDI/BTI program, joint programs (multi-Service, DARPA/Service, and cooperative efforts with our Allies) were given higher priority, although final selection was based on more comprehensive guidelines. Several projects do involve international joint efforts. These projects are Advanced Short Take-Off and Vertical Landing Technology, a joint effort with the United Kingdom; Combat Vehicle Command and Control, which will include work with the Federal Republic of Germany; and Tactical Missile Interceptor Development, which is expected to include a U.S./Israeli effort. In addition, the Ground Launched Hellfire project will build on results of earlier U.S./Sweden work. Many of the other projects to be carried out by the Service and the Defense Agencies could in fact become joint efforts as project details are developed and the work is implemented.

The DOD pursues the development of cooperative work with our Allies in other, more extensive programs. DOD annually submits to Congress a detailed description of efforts of this type that are funded under programs such as the NATO Cooperative Research and Development Program and the Foreign Weapons Evaluation Program.

SEEKER TECHNOLOGY

Dr. KERBER. No. In the seeker area, we are looking at what kind of multimode seeker we may develop cooperatively in the NATO arena; we are also collaborating on that. The seeker technology programs will complement and fold into that.

Senator WIRTH. Well, perhaps we can get a reply for the record, if you could do that, Dr. Kerber.

And let me ask you a related question. Have you done any kind of an analysis that, were we to have an aggressive CDI program at the Department of Defense, what impact would that have on our own defense industries? What impact might that have in terms of displacing purchasing from our own defense industries in favor of purchasing from our allies?

Have you done any kind of analysis on that?

Dr. KERBER. We have, and let me put that into perspective. We had looked at an assessment of what part of the science and technology program affects conventional defense. Well over half of the $5.4 billion that is in the science and technology program affects conventional defense.

SCIENCE AND TECHNOLOGY PROGRAM

The new funds, which are in the neighborhood of $277 million, are not a significant increase over what we have already in the Department of Defense science and technology program for conventional defense. So I would not anticipate that would have an effect or an impact.

Senator WIRTH. Now, most of that is the development of new technologies under the BTI program, right?

Dr. KERBER. The point is approximately 70 percent of our science and technology program is addressed toward conventional defense. If you take 70 percent of $5.4 billion, you get over $3.5 billion.

That is the fraction of our tech base assets that go toward conventional technologies. And so, if we add onto that $277 million——

Senator WIRTH. I understand that. What I am after is, we heard some very, I thought, compelling and interesting testimony from Ambassador Abshire on efforts made between the United States and our NATO allies on purchasing and research and development. And the thrust of the analysis that he gave us for a long morning in front of the committee was that there was an enormous area of room for cooperation.

It seems to me that, if we are going to ask for cooperation from our NATO allies, that the street runs the other way as well. And that I understand is part of the purpose of when the authorizing language was written in 1987 for CDI, was to pursue that.

What I am trying to do is to get a sense of what kind of action has been taken over the last year in that area that might have been pursued by the Department of Defense. You are going to supply that for the record.

And second, if we were to pursue that aggressively, what impact would that have, economically on our defense industries which it seems to me is another question that would be logical to consider if in fact we were taking that initiative seriously.

So maybe you could give me a reply to that question as well.

Dr. KERBER. I certainly can. We did take it seriously and, as you know also, we have the Nunn amendment moneys which we are aggressively spending in the international cooperation. In fact, many of the projects associated with the Nunn initiative were al-

ready ongoing and we were sorting out those technologies and areas where we could collaborate.

For example, the Ada program was the first one in which we had an international agreement in collaborating in that way, and they are continuing.

Senator WIRTH. Well, I will look forward to hearing from you.

SEMICONDUCTORS

And if I might, just one brief question while you are here, Dr. Kerber. You testified in front of Senator Bingaman's subcommittee about 3 or 4 weeks ago on the semiconductor issue. And at the point I remember you told the subcommittee that, as far as you knew, everybody at the Department of Defense was evaluating the Defense Science Board report.

And Mr. Costello said that a variety of initiatives related to the DSB report would be rapidly developed. Since then, we have heard different opinions on what the OSD has decided to do on this and what kind of response you have gotten from OMB.

Perhaps you could fill us in as to what the position is of the administration on the semiconductor initiative and if there is a decision on what is to be done and what form that initiative would take?

Dr. KERBER. The decision has not been made, and I am not aware of any real difference in opinion. I am sure that what Dr. Costello indicated was that his office is looking at a variety of issues in addition to the semiconductor technology issue, and of course, that is true.

We do not have a Department plan that is ready to be presented at this time. We are currently working with the White House Science Council, and we have a group studying, as I indicated earlier, how to attack this problem not just from the defense point of view, but from a multi-agency point of view.

Senator WIRTH. It seems to me that that is the same answer we got a month ago.

Dr. KERBER. But we are working on the problem.

Senator WIRTH. At the same time we got that answer, we have been getting a variety of responses from various groups saying that this is a critical problem, this is something that ought to be addressed in the authorization bill put together by the Senate Armed Services Committee and the House Armed Services Committee.

We will be starting to mark up that bill soon after the Easter recess, and we have received no response from you. How are we going to integrate your recommendations into our work?

We are told by you and then by Mr. Costello: Well, do not do anything, we are going to put a semiconductor initiative together and we will be back to you shortly. We now have 10 days to go before markup and the answer is the same today in response to my question as it was a month ago.

What are we going to be able to anticipate coming back from you, if anything.

Dr. KERBER. We are working the problem very hard on three fronts or so. We are working with the White House Science Council, which is looking at that from a national perspective. We are

having an economic policy group develop an action-oriented plan. We are looking within the Department of Defense for a position to take relative to the Defense Science Board study.

Unfortunately, just like the response to other technical issues, we have to go through the technical opportunities before we decide on a plan, and we are doing that.

Senator WIRTH. You know as well as I do that this is not really a technical issue in that sense. It is a policy question. It is a political question. And I just wanted to say that we are getting very close to the markup in the Armed Services Committee. And per our earlier discussion, I once again want to remind you and Mr. Costello's office that we have been promised a response.

We have not gotten one yet. It is difficult for us to move until we have that. You asked us to wait until you got it together and we are still waiting. And we look forward to hearing from you.

Dr. KERBER. I understand that. I do want to comment that I think it is a technical issue. What the Department anticipates is to develop the processing tools and equipment that we think are appropriate so that we have the technology we need. That is why we see it as a technical issue from the DOD point of view.

Senator WIRTH. That is a different answer from the one of a few minutes ago, in which you said Mr. Costello was also looking at other technologies and how they might fit into the initiative, which is an issue——

Dr. KERBER. That is a parallel effort.

Senator WIRTH. Thank you, Mr. Chairman.

Senator BINGAMAN. Thank you very much.

I think that is all the questions that we will burden you folks with today. Thank you very much.

And we will ask our other two witnesses, our second panel, to please come forward, Dr. DeLauer and Dr. Braddock, if they would, please.

Senator WIRTH. If I might, Mr. Chairman, the report accompanying the fiscal year 1987 DOD authorization says: "The committee intends the CDI to constitute the start of a dedicated comparative evaluation program in which systems developed in other countries or for other applications might be evaluated for use by the U.S. defense forces."

Senator BINGAMAN. Dr. DeLauer and Dr. Braddock, let me welcome you to the committee, to the two subcommittees here. Dr. DeLauer served as the Under Secretary of Defense for Research and Engineering and has had a long involvement with new system development.

Dr. Braddock recently served as the Chairman of the Defense Science Board study that examined a number of armor/anti-armor problems of our military forces. We look forward to hearing your views on this set of issues and what we ought to be doing.

Dr. DeLauer, would you like to go first?

Dr. DELAUER. It does not make any difference, Mr. Chairman.

Senator BINGAMAN. Why do you not go ahead and give us your testimony, and then we will have a couple of questions.

STATEMENT OF DR. RICHARD D. DeLAUER, PRESIDENT, ORION GROUP, LTD., FORMER UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING

Dr. DeLAUER. Thank you, Mr. Chairman.

It is surprising—I have had the good fortune not to have to do this for a couple of years. It is surprising, the more things change the more they remain the same.

Senator BINGAMAN. It is surprising how nice it is not to be here, right? [Laughter.]

Dr. DeLAUER. It is not too bad.

You heard from the Department in regard to some of the program activities. Certainly in the note that I got asking if I would indeed comment there were a long list of programmatic questions and things that were to be considered.

I would like to take a slightly different tack, if it is permissible with you, Mr. Chairman, and really kind of focus on this issue of CDI and BTI from a slightly different point of view, more toward the concept that Senator Nunn did when he restructured the committee, where he really started focusing on mission areas and things that indeed had broader utilization across the board other than continuing to focus from a congressional oversight standpoint on very narrow programmatic issues and not looking at the total thing.

My view, with the limited budget and with the pressures on the budget—we had, as Senator Nunn said, a markup here a little while ago—that this whole issue, along with some of the others, but particularly these issues because of the question of the conventional forces, more important in some cases than the strategic issue, has been the fact that we have to make some selections in regard to priorities.

And I would like to suggest to the Senate through this committee and subcommittee that you might take a view of reviewing and selecting and prioritizing the questions of the consequences of these technologies based on a very simple test.

And the primary test that I would like to see you embrace is that one of survivability. If you look at the technologies that are presented by the Department, if you take a look at the capabilities that you see in the future, that if you really do indeed take the view that survivability is something that we are going to look at, because it means we do not have to buy as many of them—we are never going to be able to out-force structure the opposition. We have far too less of a force structure against a major opponent and we have a hell of a lot too much force structure for the non-major opponent.

So we are in the dilemma of having a force structure within the Department that is too little or too much, and we have to come to grips with it sooner or later, probably sooner rather than later. And there will have to be some decisions made.

I do not think they can be made completely on "the threat." I think you have to take a look at, what does it do to our capability? And so my suggestion and what I would urge you to consider seriously is the fact that you take a look at these things that you approve and authorize during the next year or two in regard to how

they really contribute to the survivability of our forces and of our manpower.

Now, let me give you some quick examples and then we can get into questions. I notice that on the list what was missing was to me one of the most important programs that I tried to push when I was in the Department, and that was the Mark 15 IFF.

If indeed we could develop a good IFF system, the ability for us to be able to engage the enemy outside of visual range would enhance the survivability of much of our air assets. We have got guidance technology and sensor technology that will perform well out of visual range. We are not utilizing it.

Our Stealth technology is just for that purpose. It is outside of visual range to a certain degree. We can operate that way. The whole AMRAAM program would be different. IFF just happens to be a keystone in that, to be able to do that.

If you look at the data that is on the AMRAAM simulation, you will find that our pilots flying the simulator tend to go clean in to the visual range point before they engage. They go in as close as they can to the no-escape zone and their attrition goes way up.

We cannot afford to attrite our forces. We have got to survive.

There was a big discussion about the quietness of submarines. We should be focusing on the technologies that will make our submarines more quiet.

We should try to do more with our fusion program, which we are trying to do in some of these technologies, the fact that we can use the information that we obtain to have a higher degree of confidence in our targeting and therefore lower the attrition.

The Lantirn program was a past example of something that provided a greater degree of utilization of the F–16 with a higher degree of survivability because you could fly it at night, you could fly it more sorties. You would not have to fly all the sorties in the day.

This is the direction I would hope that some way in the language that you would be able to review these technologies, particularly in CDI, and BTI too, because they go both ways, that focus should really be on how we are going to have a higher degree of survivability.

Are things going to be mobile? Are things going to be self-protection? Our present anti-aircraft surface to air capability in Western Europe is non-survivable.

We had a terrible argument for years with the service on just whether or not we could shelter our airplanes. Just the mere sheltering of our aircraft puts a degree of survivability that was way beyond what we had. We are finally getting our European allies to do some sheltering.

Those are the kinds of things that have to be done, and those in my view are the way you should be judging whether or not some of these programs make sense. And so with that, why, I will let you just ask some questions and let us get to that. It is a different approach to this thing.

Senator BINGAMAN. Fine. Before we go to questions, I would like to ask Dr. Braddock if he would go ahead and summarize his statement. And then we will ask you both questions.

STATEMENT OF DR. JOSEPH V. BRADDOCK, SENIOR VICE PRESIDENT, THE BDM CORP.

Dr. BRADDOCK. Thank you, Mr. Chairman.

I have some very brief comments to make. They really in a sense are not very different than Dr. DeLauer's, but I am going to make them relative to the study that you mentioned, that the defense science board did relative to the armor/anti-armor competition, because that has to do with survivability as one aspect of it.

In that particular assessment, I believe we learned, or maybe relearned, a few things that we knew already in a much sharper way. We looked at that balance, if you will, the critical balance, and we looked at it over time. And we found ourselves on the wrong side of it. I will not go into, because of the open nature of this hearing, the technical details.

But I was very pleased to see that the balanced technology and conventional defense initiatives have an armor/anti-armor component in them. It is needed.

Let me say something, though, about the focus, because I think that is what you are after. What we found was—what we looked into was an area where we were behind. One of the questions we asked ourselves was: Why are we behind? Here we have all sorts of technology in this country. We have the ability to focus it on occasion.

Well, first of all, we decided after looking at it that one of the reasons why we were behind was that we were not getting the benefit of all the capabilities we had in this country. So one of the things you might consider in looking at CDI/BTI is, where are we behind, where do we have the opportunity to really leap ahead and make a difference?

We have to do something about where we are behind. Let me talk about that. We concluded that one of the reasons for being behind was this lack of bringing all the capability we had to bear. And you might say that is a money issue. To some extent it is.

But actually, if you look at the places we are ahead, there is a simple lesson in it. You know, we build very good aircraft, we build excellent nuclear weaponry, we build very good electronics, and we field them, they work. We build guided missiles that are pretty good.

Why is it not true that in the armor and the anti-armor areas we are not ahead? Part of the reason is that, if you look at the areas where we are ahead, we have a real intellectual competition going on. It is not just a price competition. It is an intellectual competition.

So one of the things you might stimulate with CDI/BTI is more Intellectual competition, to get the things this country really has in its tech base out working with the forces that we have.

Why? Well, we cannot do much to control what the Soviets are doing. I mean, arms control can carry us just so far. We apply it to nuclear weapons, we apply it to those areas where the dangers are the greatest, but we are still left with this conventional problem.

How do we compete with them? I think that is what you are in CDI about. Well, let me describe the shape of that competition in

different terms than the way you have heard in relative to the armor/anti-armor thing.

The Soviets every year modernize their army at a rate such that, were you to take that equipment and put it into the United States Army and the heavy part of the Marine Corps, you would modernize those forces every year completely. In other words, the Soviets are modernizing one U.S. land force per year or, if you want it in a slightly different way, one half of the NATO land force, the heavy NATO land force, every year.

That is an intense competition. When we looked at that competition, we were not too surprised to find ourselves behind when you have the R&D capabilities that they have, the manufacturing capabilities, and the huge force structure which they have.

So if we are going to compete in that arena—and I just use that as an example, because it is an area you are pushing in BTI/CDI—that we will only compete if all the assets this country has are used in that competition, just as when we compete in aircraft, just as when we compete in submarines, we use all the capabilities we have.

Now, to some extent, as Dr. DeLauer said, you have broken this down, broken yourselves in a sense down and rebuilt the organization here to reflect mission areas and so on. I think one of the items you can get at with CDI/BTI is, are we doing that in the base that you are funding?

As an example, there is a very strong materials capability in some of our universities, in the Department of Energy's laboratories, and in parts of industry that never came into this armor/anti-armor competition, were not even part of it. Some of the major manufacturers in this country who have strong capabilities in materials did not do any of that kind of work.

So I believe that one of the things you are going to have to do with your initiative is to find out how it reaches out to all the capabilities that we have.

The second thing that I believe you are going to have to do with it is to do more than just offset quantity with quality. We have been saying that to ourselves for a long, long time, and the Soviets have been pushing quality, and in some areas they are reaching parity.

We are actually going to have to do something that I though I heard going on here earlier as I was sitting in back, and that is find a way to pick the winners, find a way to kill the losers, and push the winners fast. I think that is sort of what you are asking for. That is a tough job to do.

I will close my remarks on what I think is needed for it. We often talk about leadership on one hand and management on the other, and I think in this particular case, your initiative here, we really need the best of both, maybe in my terms anyway.

I refer to leadership as picking the right things to do; management is doing things right. And I think in this initiative you have got to have both. You are going to have to pick the right things and then do them right.

That is my statement, Mr. Chairman.

Senator BINGAMAN. Thank you very much.

I will ask a couple of questions here to get started. I gave a talk at Brookings a few weeks ago and Gen. Glenn Kent was there. He made a point that sounded right, and maybe each of you may have alluded to this, but maybe you could give us your comments in a little more depth.

GETTING TECHNOLOGIES INTO THE FIELD

He said the problem is not with our emerging technologies. He said we have a lot of technologies that have already emerged. We just cannot get them in the field. I do not know that that is precisely the subject of this hearing, but it is certainly related, when we are trying to find ways to improve our conventional capability by improving the technology.

I would be interested in either one of you commenting on General Kent's point.

Dr. DeLauer. Mr. Chairman, I addressed that issue exactly. I was kind of the daddy rabbit for the emerging technologies and emerged technologies during the time I was in. That was the Secretary's initiative and I was the guy that had to push it.

And as Senator Wirth mentioned, Ambassador Abshire bought that. That was all part of the CNAD thing that we did.

I addressed specifically the emerged technologies, and just for reference it is in that little book that was put out by the Council of Foreign Relations on NATO, that Senator Nunn was part of the organization of that particular book. And he did not have a chance to write his piece because of the press of other business, but that exists and I think it will show you those emerged technologies that really should be pushed.

And they are not that difficult. IFF, what I mentioned, is one. But the whole question of intelligence fusion, which Joe and his people work on, are some of the other technologies that already exist. The whole question of millimeter wave guidance and the question of some of the smart weapons, those are really emerged technologies. They have not been fielded, but there is no invention any more.

I call emerged technologies ones that essentially the fundamentals of the engineering have been done. What it takes is to essentially insert them into the systems and field them and have the troops use them. And the list, it is hard to say what has emerged and what is not emerged. But there is plenty of examples of both.

Senator Bingaman. Did you have any comment on that?

Dr. Braddock. I agree with Dr. DeLauer on that, and General Kent.

Senator Bingaman. OK. Let me ask about one other issue and then I will defer to Senator Levin.

The question of reaching out to use all our capabilities to pursue these, I gather what I am hearing from you, Dr. Braddock, is that there are areas in which universities, DOE labs, did industry labs need to be utilized much better in this initiative in order that we get some of this work done?

Too much of it is not being spread enough. Is that the basic message, that some of the best performers of our research are not participating in this important research?

Dr. BRADDOCK. That is right. I think that "spreading" I would not use. I do not think you meant "spreading" in a manner of giving everybody a little bit. I think the context of that is really getting in those people who can do the job for you.

And we have substantial capabilities in those areas where we are behind to correct that condition. Now, because this is in a sense maybe new money—that might not be exactly the way to describe it, but it is a new initiative—we should encourage people to come in who can contribute and intellectually compete with people that are in there already.

In one of the programs that I saw start out this way, particularly in connection with that armor/anti-armor, without going into who the companies were, those that came in to compete that had not been in before were willing to throw their own money into it, sometimes two dollars per dollar.

In that regard, I think what we should make sure is that we do reach out for those people. They are out there. We can get the help.

Senator BINGAMAN. Is it fair to say that DOD labs are getting too much of this money at this point? Is that——

Dr. BRADDOCK. No, I would not say that. I would say it is still a matter of focus. It is not a matter of what is spent in-house versus what is contracted out. I think it is the tough job of making the decision about where you can get the capability.

Dr. DELAUER. Let me add to those remarks. One of the companies that wanted to get more involved in the defense area was 3M, and it turned out I went out and visited them. And it turned out 3M had done a tremendous amount in laser disc recording. As a matter of fact, it is the heart of some of this new digital recording that there is so much discussion going on.

The Army put a procurement out. Well, it turns out that for 3M to bid it, even as a subcontractor—that their organizational structure was not configured to handle the Government bidding process. All this question of charging and mischarging and the cost accounting standards—just their structure was not there.

They had to bid a fixed price and they could not bid essentially a cost type proposal. And they opted out because the cost of bidding that particular job was more than they would have made off of the particular procurement.

Now, this may sound like it is a nuthouse and, you know, we have met the enemy and they is us. But to work in the area of government procurement and to be able to be a supplier is not a simple matter. And the things, I bet, that Joe looked at, if the DSP looked at it, he found that there were a lot of people out there that just—it is hard to get that information from them. They are just not configured to deal in the government area.

Some way or another, we have got to get over that bridge. The same way with the tech transfer. I do not know how many times I have sat in front of this committee and in the House and said: Look, unless you people solve the damn question of tech transfer, we are not going to have any of these emerging and emerged technologies happen: we are not going to have the thing that you discuss, Senator Wirth, when you talked about which things we were

going to get from the Europeans or which ones we are going to give to the Europeans so they do not have to do it themselves.

It is nonsense that we do not share our low observable technology with the Europeans. It is crazy. But it is something that has to be addressed by this committee. I know that Senator Nunn has had discussions with the Department on it.

But it got focused into one area of the policy group in the Department of Defense, and it has been—I am telling you, that has been like trying to move a glacier.

Senator BINGAMAN. Thank you.

Senator Levin.

BALANCED TECHNOLOGY INITIATIVE

Senator LEVIN. I wonder, if you have not already done so and I may have missed it, whether you would both comment on the BTI, the balanced technology initiative, what impact it has made, if you know of any, what your general gut reaction is to it?

Dr. DELAUER. Well, I think I can only give you a general reaction, because the last couple of years I have not followed every single program like I did before. Any of these initiatives tend to focus the effort on, and I think to that degree they are the right thing to do.

I thought the balanced technology initiative was the right thing to do and I did a little bit of work last year on identification of some of the things, particularly between the strategic and tactical and they are common technologies that you do not have to embrace one concept over the other, that you can work on the technologies and they are applicable to both sides.

And we came out with that kind of a list. I think that is part of the prioritizing and selection that Joe talked about, and I think you have to do more of it.

Do not take it as an end in itself. I think that there is responsibility to see whether or not progress is being made in it. And just because a thing is on the list for the time being, whether or not it should be embraced and continued, even when the possibility that it might provide a real advantage disappears, is something we have to keep looking for.

But I think all three of these—I think the weapons testing, the evaluation program was very good. The problem you have is not what you want to do over there in the Pentagon. It is after you decide what you want to do, is how many people keep you from doing it. And it is very easy to keep you from doing something.

And one way you can get something done is if indeed it is focused and there is a requirement to go to it.

Senator LEVIN. Dr. Braddock.

Dr. BRADDOCK. I would second everything that you heard and only add that I think the focus in the current program is pretty good. I think the areas that were covered by Dr. Kerber and Mr. Fredericksen are the areas where we should make a push.

The big issue is can you keep it going? Can you turn this now into systems that make a difference out on the battlefield?

Senator LEVIN. To what extent had the private sector been involved in BTI?

Dr. BRADDOCK. In this set of programs?

Senator LEVIN. Yes.

Dr. BRADDOCK. Well, as you were told, this particular set is just starting to move contractually. The money is moving out to people.

Senator LEVIN. Do the folks not know about it out there in the private world, or is this kind of just internal Pentagon?

Dr. BRADDOCK. No, it is well known.

Senator LEVIN. Are there a lot of ideas flowing to the Pentagon for using this money?

Dr. DELAUER. I think there are.

Senator LEVIN. That would not otherwise go to the Pentagon unless it were there?

Dr. BRADDOCK. Well, that is hard to say. Any time you say something, you have got in a sense a new pot of money to work with, the ideas come out of the woodwork. You have got more ideas than you can fund, there is no doubt about that.

Senator LEVIN. Are there any specific changes you would make in the BTI program?

Dr. BRADDOCK. The one that was discussed here? No, not right now, because I think you have got the right areas. You would like to see how it is going to go after a year, and you would like to see, I think, some winners and some losers come out of it.

I mean, this is high tech. Some of these things are not going to work and some of them are going to work very well. And I think that is where the money has really got to come from in the long run, because you cannot keep funding everything.

And the losers are in a sense just as important as the winners are, identifying the losers early so they do not absorb money.

Dr. DELAUER. I do not know if you were in the room, Senator Levin, but what was not on the list, at least in the material I saw, was essentially the emphasis on IFF and the Mark 15 program. I felt that that was important.

I would add to that list, just to answer your question completely, I would focus a little bit more on some ramjet technology. It turns out you cannot do some of the things I suggested, such as fighting outside visual range, with packaging that comes from just propellant.

Senator LEVIN. In terms of the process, though, that they are using to identify projects for funding, you do not have any specific suggestions on how that process could be changed or improved or whatever?

Dr. BRADDOCK. No. You would not want to narrow it in a way such that it would eliminate people coming forward with suggestions. Absolutely nothing wrong with the services and the agencies and what-not coming forward with programs. They should do that.

Senator LEVIN. Thank you.

Senator BINGAMAN. Senator Wirth.

Senator WIRTH. Thank you, Mr. Chairman.

Dr. Braddock, you mentioned picking winners and losers about five or six different times. Can you elaborate a little bit on that?

Dr. BRADDOCK. Well, it is something you simply have to do, when you have finite resources, no matter what you are doing, whether it is CDI or whether you are trying to figure out how to modernize

an office or whether you are trying to figure out what to bid on in business.

The thing about losers is that you tend to regard them as children. You know, you really do not want to see a child go away. You put your heart and soul into making something work, and it does not work as well as it might; easier to hold onto it than let it go. A tough decision to make.

But if these technologies that have been chosen are the correct technologies, some are going to be better than others and you kill some of them, kill those that are not really going to pay off.

WINNERS AND LOSERS WITH BUDGET DILEMMA

Senator WIRTH. Well, I would ask you to elaborate. We are faced with the budget dilemma that you witnessed part of and you are more than familiar with. What are the winners and what are the losers? What should we put at each end of the spectrum?

Granted most things fall in the middle. What are the real winners? What are the real losers?

Dr. BRADDOCK. Well, do you mean inside this program which is just starting? I do not think you can tell right now in that program. But let me give you a couple of things that might help.

You have got smart weapons, you have got target acquisition battle management, C-3, armor/anti-armor, okay. In the smart weapons area, we have seen over the years, over too many years probably, too many concepts come forward, be developed for a while, and then not make it.

We are finally putting a couple into development that are not in your program here, and these are more advanced. Okay, so we finally have sort of a second generation of smart weapons, those that are slightly smart. And what we hope to come out of this smart weapons program is a really smart weapon, okay.

Technologically, there are probably four or five different possibilities. The thing to do is to put enough money into them—if you really want to find the winners and the losers, to narrow the thing down early, make sure that you are not putting $500,000 into something that really requires $5 million to find out whether it would work or not.

So when you look into this, you have got something like 35 projects, $200 million, about $6 million apiece on average. If that is about where it is, it is not too bad. If you have got programs in here which are being funded at 375K, you know, $1.2 million, you are not going to find out for a long while.

Senator WIRTH. How about on a macro scales, the winners and losers? I mean, on the basis of your experience, if we are looking at various systems and requests that come in, what would you be classifying as winners and losers in terms of the choices that this committee is going to have to make?

Do you have any advise for us on that?

Dr. BRADDOCK. Do you mean over the long list of things the Department comes forward with to you on?

Senator WIRTH. What immediately comes to mind?

Dr. DeLauer. I have one for you. Carrier battle group. The group, not the carrier but the battle group. A waste of money, not survivable.

Senator Wirth. That was going to be my next question. You are talking about winners and losers, and you talked about survivability. The losers are non-survivable systems.

Dr. DeLauer. I was trying to give you a criteria that you yourself simplistically could kind of make your own judgment.

Senator Wirth. I need all the losers I can get, Dr. DeLauer.

Let us boil it right down to its basics: What is survivable and what is not survivable?

Dr. DeLauer. That is right, that could be one test. The other test could be the other way: Does it provide a high kill probability on the other end? That is one of the advantages of some of the smart munitions. You get a higher kill probability per sortie or per round. There is another criteria.

I mean, what you are trying to do is, it we did not have the problem that Joe alluded to, the fact that they can essentially modernize their force every year—there is a little discussion Senator Levin and I used to have on whether they are ten feet tall or not.

But the point is, they do spend a lot of money that is never matched, because we do not have the save kind of accounting units. But the consequences are that they keep making force structure. I think they are going to have to change, I really do believe that. That I do believe.

Senator Wirth. Give me two more winners and two more losers?

Dr. DeLauer. Two more winners? Two more winners?

Senator Wirth. Two more winners and two more losers?

Dr. DeLauer. Okay. Passive acoustic ASW is an obsolescent technology. Submarines are getting quieter and quieter and quieter. So all the money you are spending in passive acoustic technology.

A winner would be non-acoustic technology ASW.

Let us take a question of stand-off. If you get much better stand-off ranges in the tactical area, not in the strategic area but just in the tactical area, higher stand-off ranges with the accuracies we have now going after their aircraft on the ground, the anti-air or tanks in the staging area, attack on the follow-on forces, much more emphasis on that than trying to just pile up the capability.

You have to do them both, but if you want a winner that is what I would do.

Dr. Braddock. Could I add one thing? Why do you not curtail the acquisition of dumb munitions?

Senator Wirth. What?

Dr. Braddock. Dumb munitions, unitary munitions that cannot really do much for you. We have large stockpiles of them. We use them up in training, large unitary weapons like for artillery or for air delivery. And emphasis area munitions for a variety of reasons: One, they are more lethal; second is they can generally, because they are in dispensers, be launched from further away, to make Dr. DeLauer's point on survivability, keep the aircraft away from the defended target.

If you take that general tack, I think you will be helping quite a bit. I mean, we have factories that turn out those things and you

have to do something about that economically. But we are not getting much payoff.

Senator BINGAMAN. Are any of those in Colorado? [Laughter.]

Senator WIRTH. There probably are.

Dr. BRADDOCK. There probably are, and there probably are in a few other places, too.

Dr. DELAUER. Some in New Mexico.

Senator WIRTH. I remember Agamemnon's catalogue of ships. We ought to get the Braddock-DeLauer catalogue of winners and losers.

Dr. DELAUER. To carry this a little bit further, read Mr. Clancy's book. Mr. Clancy's book is—I wrote him a note and said he read my notes. Read it.

Senator BINGAMAN. Is this the first one or the second one?

ISSUE OF SURVIVABILITY

Dr. DELAUER. Red Storm Rising, because it carries a greater degree the issue of survivability. I sat right here and presented a program in 1981 where I was trying to advocate sheltering aircraft on Iceland and buying five more AWACS, and sat right here and presented to the committee at that time the strategic modernization program.

I remember T.K. Jones and I presented it to you we ought to buy five more AWACS to defend Iceland. You people went along with it, but we could not get the Air Force to ever put it in. And what did Mr. Clancy do? He made an amphibious assault on Iceland and nailed them all.

You are sitting here spending money hand over fist on B–52 upgrade. We spend a half a billion dollars upgrading, changes on B–52's that are absolutely non-survivable. Their base escape is marginal, their en route survivability is terrible, and they have no penetration capability whatsoever.

Senator LEVIN. But other than that, they are okay. [Laughter.]

Dr. DELAUER. They are terrific. They carry four pilots, they are terrific.

I can give you a long list of them.

Senator WIRTH. That carrier disappeared at high speed, did it not. [Laughter.]

SEMICONDUCTOR INITIATIVE

While we have these two distinguished witnesses here, do either of you have any comments on what kind of a semiconductor initiative we ought to be asking the department of Defense to undertake?

Dr. DELAUER. I was on the Defense Science Board. You got the report. I would have made it even stronger.

Senator WIRTH. Elaborate a little bit, could you?

Dr. DELAUER. Well, on the Defense Science Board report, you know, those things are not always unanimous in their views. Norm Augustine was the chairman.

The part I had was to try to find the money. Remember, the recommendation was to put in a cooperative, whatever word, production line focused primarily on memories. So that, because it em-

braced all of the process technology and the large investments that would have to be made separately by companies going into the business.

And what we were trying to do was to have a demonstration or capability to be able to focus on the rapid improvements necessary in lithography or in implantation and the whole thing in regard to a particular microelectronics chip. Now, we knew that was going to cost some money, and one of my jobs in writing that report was to go find the money.

And it is the question that was asked earlier. Do you really have new money or do you have to take it out of somebody else's sandbox? And I write a whole chapter on where you could get the money out of the present defense budget if you wanted to.

You would just stop certain things and take that money and put it in to do this. We are talking what, about $200 million a year to get this thing going.

It was the same argument we had in 1977 on very high speed integrated circuits, when Bill Perry had the R&D job. And the Defense Science Board was the one that pushed the very high speed integrated circuit program. And just by the seed money—it was not insignificant. We spent a couple of billion dollars in the ten years.

But in the beginning, the seed money in very high speed integrated circuitry, which was not embraced by the computer industry but was by the signal processing industry, was almost tenfold—had a greater investment on the outside than they did inside.

For instance, I spent $100 million of invested capital with TRW on VHSIC where our contract back was about maybe, all told, about $20 million, maybe $15 million.

Senator WIRTH. I am not sure I have seen that, your chapter.

Dr. DELAUER. It never got published.

Senator WIRTH. Could we get a copy of that?

Dr. DELAUER. No. The Defense Science Board reports go through the process. I am just reporting to you——

Senator WIRTH. How can we get a copy of that, Dr. DeLauer?

Dr. DELAUER. There is no copy of what I wrote. It ended up on the cutting room floor.

Senator WIRTH. Did it get shredded or what? [Laughter.]

Dr. DELAUER. Well, I wrote it out just like I said, and I gave it to the chairman, and when they got through editing it they decided not to put in a chapter on how you would fund it.

Senator WIRTH. How about a chapter on winners and losers?

Dr. DELAUER. I think it is a good question. You know, the industry association has proposed the very same thing, the Semiconductor Industry Association. The SIA has proposed kind of a variation on the very same thing we proposed. The difference is—and I think that Norm Augustine testified either before this committee or the House, and he sent me a note the other day and said what he said. And I think he pointed out that the two proposals were nearly similar, except that there was one, the DOD one, had a little higher rate of production than the one that the SIA was proposing.

And that of course would go according to how much money they wanted to invest. But the rationale for doing it was the same: Do it like the Japanese do it, do it once, and then emulate it as the

market says, instead of everybody doing it in parallel and then all of you starving to death.

Senator BINGAMAN. Senator Nunn, you have not had a chance.

Chairman NUNN. Mr. Chairman, I have been in and out. I want to thank our witnesses because I have great respect for both of them. I wish I could have heard all of the testimony. I will try to catch up on it.

STAND-OFF MUNITIONS

Have you talked about stand-off munitions at all? Do you think the services are doing enough on that?

Dr. DELAUER. Well, I think that my own view is that the programs there are good, you know, the ones that you are aware of and I am aware of in the Air Force. Make them stick to it. Do not let them give up.

Make them—my problem was always seeing how much money they were putting into the out years.

Chairman NUNN. Did you give your reasons for thinking aircraft carriers were losers now?

Dr. DELAUER. Non-survivable. The aircraft carriers themselves are a different question. I think they can be survivable under a certain threat scenario. That is an argument I have had, is that the carriers are terrific in force projection, but the threat is very low. They are just great for force projection in peacetime, just like they are being used now, or in low level conflicts.

In a high threat area, especially if it may escalate, then the carrier battle group and the carrier are non-survivable. But as a carrier by itself, even in a more global high intensity conflict, if put in parts of the world where they are not under that kind of a threat, which is really the Backfire land-based aircraft threat, they are very good for sea control and things like that, because they generally can handle almost any kind of submarine.

Chairman NUNN. It was not your strategy, then, that had the carriers going right up to the Soviet shore on the Kola Peninsula and taking that? I thought that was the DeLauer strategy. [Laughter.]

Dr. DELAUER. Now, come on now. Senator Nunn, there were only two times that you and I disagreed. One, when you insisted I give you a number on SDI and another one accusing me of fostering John Lehman's view of the Kola Peninsula attack. No way.

Senator LEVIN. I just have one additional question. You have been giving us winners and losers, and it is very helpful. I wonder if you would have any help for us on the 1988 Presidential nomination? [Laughter.]

Dr. DELAUER. Present company excepted? [Laughter.]

Senator LEVIN. Present company absolutely included. [Laughter.]

I think this discussion of winners and losers, by the way, is extremely helpful from your perspective, and it would be useful if you fellows would be willing to do it, to put some thoughts down and get them to us. We could make it part of the record.

But I would also ask in this case that they be circulated to the members here, because it has been very interesting.

Chairman NUNN. Could I ask one more question?
Senator BINGAMAN. Sure.

B–52

Chairman NUNN. There has been some consideration of turning the B–52 into much more of a conventional application, using it that way. I was not here, but did you say that you did not think that would work?

Dr. DELAUER. No. As a matter of fact, the 60 B–52H's for the maritime force was always in the plan. In the strategic modernization plan presented by the President in 1981, that fall, when we presented it to you that maritime force of 60 B–52H's, non-SIOP was included.

Chairman NUNN. You are saying in a strategic role they are not survivable?

Dr. DELAUER. They are not survivable. But against a maritime force they are survivable. They may not survive a Kirov with certain kinds of aircraft—if they have some VSTOL aircraft.

Chairman NUNN. You are not opposed to that?

Dr. DELAUER. No, I think they are great. They have the range, they have the payload. And boy, they are a real threat. They are land-based air. That is the threat against surface elements. Surface elements are non-survivable against land-based air.

Chairman NUNN. We can give them the same problem there as they can give us on the Backfire.

Dr. DELAUER. Amen.

Chairman NUNN. Dr. Braddock, do you disagree with that?

Dr. BRADDOCK. No. I would like to add to it, though. It depends on what you put them with. The gentleman who was mentioned before, Gen. Glenn Kent, and I worked on a program about 2 years ago relative to looking at deep interdiction with stand-off weapons, and the B–52's are very advantageous to use even on the periphery of the conflict if you have stand-off weapons and the weapons are configured to be used by those aircraft, because they can carry so much, because they are going to be nationally based, because they can be on the scene in 12 hours.

So they are very valuable.

Chairman NUNN. But you have to put the right kinds of munitions on them.

Dr. DELAUER. And do not put them into the threat envelope.

Chairman NUNN. Well, I want to thank both the witnesses. I have to run. I appreciate your clarifying that strategy.

Senator BINGAMAN. We thank you very much.

There is one more question here, if you could.

Senator WIRTH. Dr. Braddock, if I could. We did not get a chance to get an answer from you on the semiconductor area.

Dr. BRADDOCK. I did not participate in that study and I am a physicist, but solid state passed me by in the fifties when I went through my doctorate work. I am not competent on that one, sir.

Senator BINGAMAN. Well, thank you both very much for testifying. We appreciate it.

[Whereupon, at 4:25 p.m , the subcommittees were adjourned.]

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